

ACORN•USER

BBC MICRO • ELECTRON • ATOM

AUGUST 1984 £1

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on your BBC micro

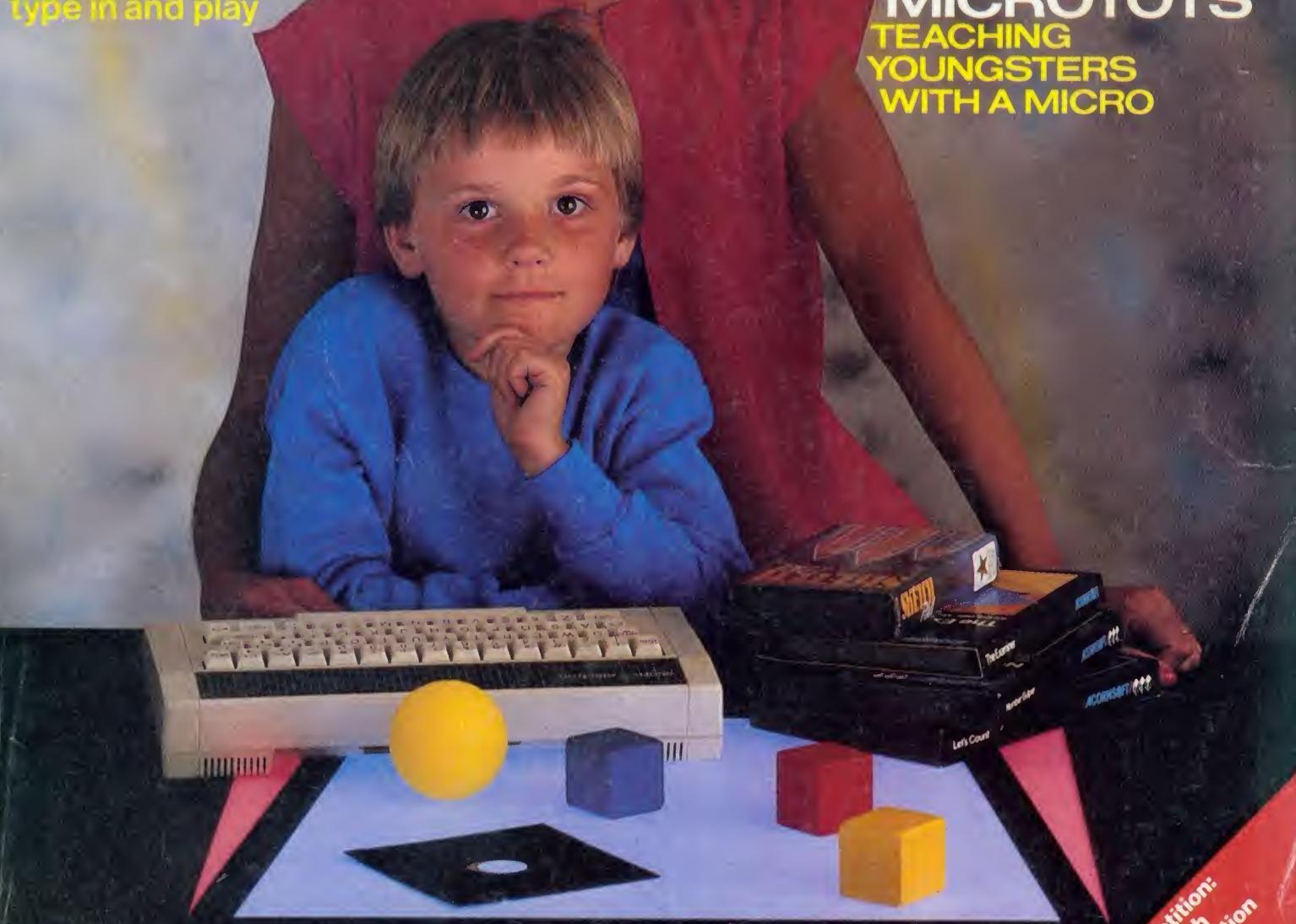
Electron:
learn to use
your keyboard

Listings:
how to find and
correct errors

Music:

a trio of tunes to
type in and play

MICROTOTS
TEACHING
YOUNGSTERS
WITH A MICRO



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August 1984

No 25

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Editor	Tony Quinn
Production editor	Keith Parish
Technical editors	Alex van Someren, Bruce Smith
Editorial assistant	Kitty Milne
Art editor	Nigel Wingrove
Art assistant	Frances King
Publishing director	Michael Potter
Editorial director	Christopher Ward

Editorial	
Redwood Publishing,	
68 Long Acre, London	
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Advertising	
Computer Marketplace Ltd, 20	
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Acorn User welcomes submissions from readers. Articles should be typed, double-spaced text, with diagrams on separate sheets. Please enclose programs on disc or cassette, with a listing if possible. Photos should be 35mm, or larger, transparencies, or 5in by 7in black and white prints. Ensure your name is on everything. Please include a suitable stamped, addressed envelope for return. Articles are acknowledged on receipt.

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New Users

First Byte

Confused by the keyboard? Bamboozled by listings? Turned off by envelopes? First Byte aims to solve these problems

First, Tessie Revivis explains how to get your fingers tapping, and produces a program to write programs

Next, Martin Phillips tests you on how well you can find and correct faults on listings – with simple, step-by-step examples

Then, we've got three tunes from Gary Pesticci and Darran Bristow which shows what can be done with a bit of sound and data

Hints & Tips

Queries from readers answered by Martin Phillips include: adding a second disc drive; using Wordwise with Epson printers; changing colours; using the cursor – and avoiding memory problems when running tape programs on disc machines

Letters

Second processors and ROMs, GOSUBs versus procedures, bugs in July's *Inspect* program, serial printers and the Atom, Electrons in Australia, 6502 op codes and high scores for games all demand our readers' attention in this month's postbag

Dear Kitty . . .

What do people actually do with computers? Are computers a passing fad? Do users know what they're talking about? Kitty answers the questions that aren't as simple as they might sound

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Business

Plan for business

John Vaux introduces the Plan series of packages with Acorn's Z80 second processor: a spreadsheet for financial calculations; wordprocessor; and a 'card index' database

Education

Teaching toddlers

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Joe Telford takes his Jottings home to explain how even two-year-olds can use the micro – with the help of parents and overlays

Zoo-time for micros

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Susan Kingsbury builds a simple activity board to entertain, educate and delight children. She uses it to take children to the zoo, but the applications are endless

Atom

Atom Forum

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Avoiding errors

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Vincent Fojut explains how left justification helps you cope with typing mistakes

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Yellow listing pages

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Easy listening

Two musical programs

Beeb Forum

Utilities from readers

First Byte

Correcting errors in listings

Beeb Forum

How it works

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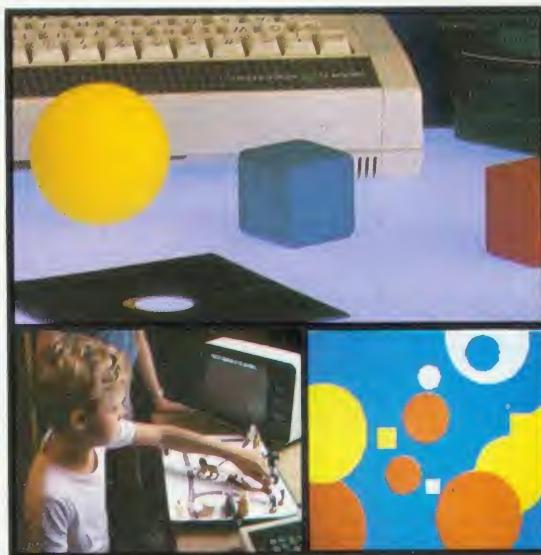
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MICROTOTS

I Teaching toddlers **104**

We introduce keyboard overlays to enable young children to use micros with the aid of their parents. If you can't type in the listings, remember you can send off for our program cassette (page 81)



II Zoo time **112**

Build a simple activity board which uses a moving figure to trigger messages on your BBC micro



Downloading the weather **27**

Michael Furminger links his BBC to satellites and displays weather pictures. Robin Mudge explains how it's done



Readers' pictures **165**

Can you rival Malcolm Banthorpe's Coke can? If so, there's a spot for you in Micro Gallery where readers display their art – and win software prizes

PLUS: Three picture-drawing programs reviewed. See page 147

NEXT MONTH...

Muscle in on the airwaves

Tune in to RTTY and the dots, dashes and bleeps of short wave radio

Super plotting

The Parfitt plotter is soon to have a scriber, opto sensor (which digitised the image here), drill and special software added. We take a sneak preview

Unicorn review

Torch offers a 10Mb hard disc, floppy disc and Unix on the 68000 chip in its top-of-the-range Unicorn. We take a critical look

PLUS – May competition results



Electronequip

(Authorised BBC Dealer, and service centre)

BBC Cassette Software	Exc VAT	Inc VAT	BBC Cassette Software	Exc VAT	Inc VAT	BBC Cassette Software	Exc VAT	Inc VAT
BCAFOOT Addictive Football Manager	5.87	6.75	BCBEWORH BES Worfhang (XBE02)	6.63	7.62	BCMSQUIC Microsoft Quick Thinking (B)	5.13	5.90
BCAFBON A & F Software Bouncer	5.92	6.80	BCBEWORW BES World Wise (XBE01)	6.63	7.62	BCOCMRWI Ocean Mr Wimpy	5.10	5.87
BCAFCHIC A & F Software Chuckie Egg	5.84	6.72	BCBSBYEO BBCsoft Beyond Basic Cassette (B)	8.50	9.78	BCPAFORT Pace Software Fortress	6.61	7.60
BCAFCYLO A & F Software Cydon Attack	5.84	6.72	BCBSCANY BBCsoft Canyon (B)	7.39	8.50	BCPAHOVE Program Power Adventure (B)	5.87	6.75
BCAFFROG A & F Software Frogger	5.92	6.80	BCBSDRAW BBCsoft Drawing	7.40	8.50	BCPALIO Program Power Alien Destroyers (Invader)	5.91	6.79
BCAFHORN A & F Software Horror Castle	5.92	6.80	BCBSORWH BBCsoft Of Who The First Adventure (B)	7.39	8.50	BCPAPALIE Program Power Alien Swirl	5.13	5.90
BCAFHOWS A & F Software Howzat	5.10	5.87	BCSEARL BBCsoft Early Learning	7.40	8.50	BCPASTE Program Power Asteroid Storm (B)	5.87	6.75
BCAFPAINT A & F Software Painter	5.92	6.80	BCBSFUNG BBCsoft Fun Games	7.40	8.50	BCPASTR Program Power Astro Navigator	4.21	4.84
BCAFPHAR A & F Software Pharaohs Tomb	5.92	6.80	BCBSGAMS BBCsoft Games of Strategy	7.40	8.50	BCPPBANO Program Power Bandits at 3 o'clock	5.14	5.91
BCAFPLAN A & F Software Planes	5.92	6.80	BCBSHOME BBCsoft Home Finance	7.40	8.50	BCPPBARR Program Power Barrage for BBC	5.13	5.90
BCAFSHRI A & F Software Shrinking Professor	5.92	6.80	BCBSMAK Making the most of your Micro (Inc book)	9.57	11.01	BCPPBEEB Program Power Beeb Tote (B)	4.40	5.06
BCAIADEV Adventure International Adventureland	7.35	8.46	BCBSMOTO BBCsoft Motorists Log	7.40	8.50	BCPPBUMB Program Power Bumble Bee (B)	5.87	6.75
BCAIPIRA Adventure International Pirate Adventure	7.35	8.46	BCBSMUSI BBCsoft Music	7.40	8.50	BCPPCAVA Program Power Caveman Adventure	5.06	5.82
BCAISECH Adventure International Secret Mission	7.35	8.46	BCRSPAIN BBCsoft Painting	7.40	8.50	BCPPCH16 Program Power BBC Chess (16K)	3.66	4.20
BCAIVOOD Adventure International Voodoo Castle	7.35	8.46	BCSPRO1 BBCsoft Programs Vol 1	7.40	8.50	BCPPCHEM Program Power Chemistry	5.13	5.90
BCAKCHIL ASK Children from Space (XBE16)	7.35	8.46	BCSPRO2 BBCsoft Programs Vol 2	7.40	8.50	BCPPCHES Program Power Chess	5.87	6.75
BCAKCRAN ASK Cranky (XBE17)	7.35	8.46	BCBSRECO BBCsoft Record Keeper (B)	10.20	11.73	BCPPCONS Program Power Constellation	5.87	6.75
BCAKFACE ASK Facemaker (XBE10)	7.35	8.46	BCBSTAXC BBCsoft Taxcalc (B)	8.16	9.38	BCPPCOSM Program Power Cosmic Combat (B)	5.14	5.91
BCAKHIDE ASK Hide & Seek (XBE11)	7.35	8.46	BCBSTOOL BBCsoft Tool Box (B)	15.52	17.85	BCPPCOWB Program Power Cowboy Shoot out	5.06	5.82
BCAKLETS ASK Let's Count (XBE12)	7.35	8.46	BCBSVUT BBCsoft VU Type (Typing Tutor) (B)	11.90	13.69	BCPPCROA Program Power Croaker	5.87	6.75
BCAKNUMC ASK Number Chaser (XBE15)	7.35	8.46	BCBSWHT BBCsoft White Knight Mark Eleven (B)	8.50	9.78	BCPPCYBE Program Power Cybertron Mission (B)	5.87	6.75
BCAKNUMG ASK Number Gulpier (XBR13)	5.82	6.70	BCBTWIN Bug Byte Twin Kingdom Valley	7.02	8.07	BCPPDANG Program Power Danger!UXB	5.87	6.75
BCAKNUMP ASK Number Puzzler (XBE14)	7.35	8.46	BCCCANDR Computer Concepts Android Attack	6.61	7.60	BCPPDEMD Program Power Demon Decorator (Painter)	5.06	5.82
BCAKTABL ASK Table Adventures (XBE18)	7.35	8.46	BCCCASTE Computer Concepts Asteroid belt	5.87	6.75	BCPPDIS Program Power BBC Osseassembler	5.06	5.82
BCAKWORD ASK Words, Words, Words (XBE19)	7.35	8.46	BCCCCHES Computer Concepts Chess	6.61	7.60	BCPELDO Program Power Eldorado Gold Adventurer	5.06	5.82
BCALABM Aligata Software ABM (Laser Command)	4.39	5.05	BCCCGAME Computer Concepts Games Galore 1	6.61	7.60	BCPESCA Program Power Escape from M's Base Alpha	5.87	6.75
BCALBLAG Aligata Software Blagger	6.61	7.60	BCCCHTC Computer Concepts Hitch Hiker	4.93	5.67	BCPPFAAC Program Power Felix in the Factory	5.87	6.75
BCALBUGB Aligata Software Bug Blaster	5.88	6.76	BCCCLOGO Computer Concepts Logo II	8.50	9.78	BCPFERU Program Power Felix & the Fruit Monsters	5.87	6.75
BCALCOSM Aligata Software Cosmic Asteroids	4.39	5.05	BCCCSNAK Computer Concepts Snake	5.87	6.75	BCPPFOOT Program Power Footer	5.87	6.75
BCALDAMB Aligata Software Dambusters	5.87	6.75	BCCCSPAC Computer Concepts Spacehawks	5.87	6.75	BCPPGALA Program Power Galactic Commander	5.87	6.75
BCALEAGL Aligata Software Eagle Empire	5.87	6.75	BCCCSWAR Computer Concepts Swarm	6.61	7.60	BCPPGHOU Program Power Ghouls	5.87	6.75
BCALFRUIT Aligata Software Fruit Machine (B006)	4.39	5.05	BCDAUSEP DACC Super 7 (Arcade games compend.)	6.61	7.60	BCPPHELL Program Power Hell Driver (B)	5.87	6.75
BCALLUNA Aligata Software Lunar Rescue (B007)	5.87	6.75	BCDS747 Doctor Soft 74	5.87	6.75	BCPINTE Program Power Intergalactic Trader (B)	6.61	7.60
BCAMALRGE Ampalsoft Cheshire Cat Algebra O level	5.13	5.90	BCFBSPA0 First Byte Space Adventure One	5.87	6.75	BCPPJETP Program Power Jet Power Jack	5.87	6.75
BCAMARIT Ampalsoft Cheshire Cat Arithmetic O level	5.13	5.90	BCFBSTFO First Byte Star Force Lander	5.14	5.91	BCPKILL Program Power Killer Gorilla	5.87	6.75
BCAMCALC Ampalsoft Cheshire Cat Calculus O level	5.13	5.90	BCFBSTR First Byte Star Trader	5.87	6.75	BCPLABC Program Power Labyniths of la Coshe	5.87	6.75
BCAMCOMS Ampalsoft Cheshire Cat Construction "O"	5.13	5.90	BCFBVAPH First Byte Valley of the Pharaohs	5.87	6.75	BCPPLASE Program Power Laser Command	5.87	6.75
BCAMGRAP Ampalsoft Cheshire Cat Graphs O level	5.13	5.90	BCGACHEE Garland Software Chemical Equations	9.57	11.01	BCPPMART Program Power Martian Attack (B)	5.87	6.75
BCAMMATT Ampalsoft Cheshire Cat Maths "O" level 1	11.05	12.71	BCGACHEI Garland Software Chemistry Inorganic Ana	9.57	11.01	BCPPMASM Program Power Mastermind for BBC	3.36	3.86
BCAMMATT2 Ampalsoft Cheshire Cat Maths "O" level 2	11.05	12.71	BCGACHES Garland Software Chemistry Symbol/For/Va	9.57	11.01	BCPPMAZE Program Power Maze Invaders (B)	4.40	5.06
BCAMTRIG Ampalsoft Cheshire Cat Trigonometry "O"	5.13	5.90	BCGAHUM Garland Software Human Body Heart & Kid	9.57	11.01	BCPPMINIE Program Power Mine (B)	5.87	6.75
BCAS1LOOP Acronsoft 100 Programs for BBC Micro	8.50	9.78	BCGAPHYC Garland Software Physics Cathode Ray Osc	9.57	11.01	BCPPNEOME Program Power Nemesis (B)	5.87	6.75
BCASAACT Acronsoft Arcade Action (SBG06)	8.80	10.12	BCGE3EEB Gemini Beebcalc (Spreadsheet)	14.75	16.96	BCPPPOKE Program Power Oice (B)	4.40	5.06
BCASARACA Acronsoft Arcadians (SBG14)	7.35	8.46	BCGE3EEP Gemini Beebleplot (Graph Plot)	14.75	16.96	BCPPPOSI Program Power Position (B)	5.14	5.91
BCASAVIA Acronsoft Avatar flight simulator (SBG02)	11.05	12.71	BCGE3EAS Gemini Cash Book Accounts	44.31	50.96	BCPPREV2 Program Power Reversi (32K)	4.21	4.84
BCASBUSI Acronsoft Business Games (SBE03)	7.35	8.46	BCGE3EAT Gemini Caterpillar	7.35	8.46	BCPPROUL Program Power Roulette for BBC	4.21	4.84
BCASCARCO Acronsoft Carousel (SBG24)	7.35	8.46	BCGE3EAT2 Gemini Database	14.75	16.96	BCPPSEEK Program Power Seek	5.06	5.82
BCASCAST Acronsoft Castle of Riddles (SBG17)	7.35	8.46	BCGE3EAS1 Gemini Easi-Ledger	14.75	16.96	BCPPSPAC Program Power Space Jailer (B)	5.14	5.91
BCASCHAN Acronsoft Chemical Analysis (SBE12)	10.20	11.73	BCGE3EAS2 Gemini Final Accounts	44.31	50.96	BCPPSTAR Program Power Starrab	4.21	4.84
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BCASCHST1 Acronsoft Chemical Simulations (SBE13)	10.20	11.73	BCGE3EIN Gemini Instat (Invoices & Statements)	14.75	16.96	BCPPTIMI Program Power Timetrek (Startek Plus)	5.87	6.75
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BCASCRAZ Acronsoft Crazy Tracer (SBG26) (B)	7.35	8.46	BCGE3EM Gemini Missile Control	7.35	8.46	BCPPWHIC Program Power Witch Salt?	5.14	5.91
BCASCREA Acronsoft Creative Graphics (SBX01)	7.35	8.46	BCGE3EPY Gemini Payroll	29.53	33.96	BCPPWORL Program Power World Geography (B)	5.14	5.91
BCASOESK Acronsoft Desk Diary (SBB01)	7.35	8.46	BCGESLEI Gemini Sleighbells	7.35	8.46	BCPPZARM Program Power Zarm (B)	5.87	6.75
BCASORAU Acronsoft Draughts & Reversi (B) (SBG20)	7.35	8.46	BCGESTOC Gemini Stock Control (ICS)	14.75	16.96	BCPSALLO Simon W Hessel Saloon Sally	4.39	5.05
BCASEXAM Acronsoft Examiner Cassette (SBE17) (B)	7.35	8.46	BCGETRAD Gemini Strategic Games (B) (E)	11.05	12.71	BCPSVUCA Program Power VU Calc	11.05	12.71
BCASFORC Acronsoft Forecast (SBG02)	8.80	10.12	BCGGTALP Gemini Word Processor	14.75	16.96	BSOSBEEB Quicksilva Beeb Art (B)	11.05	12.71
BCASFORT Acronsoft Forth Cassette (SBL01)	12.45	14.32	BCGGTMON Gemini Missle Control	7.35	8.46	BCOSGENE Quicksilva Generator (B)	5.13	5.90
BCASFREE Acronsoft Free Fall (SBG28)	7.35	8.46	BCGGTNUMB Gemini Number Quiz (B)	7.35	8.46	BCOSMUSI Quicksilva Music Processor (B)	11.05	12.71
BCASFREN Acronsoft French (Linkword) (SBX13)	11.05	12.71	BCGGTSHSA Gemini Shape Game	9.57	11.01	BRHGALA RH Software Galactic Wipeout (RHS001C)	6.61	7.60
BCASGERM Acronsoft German (Linkword) (SBX16)	11.05	12.71	BCGGTTEL Gemini Stock Control (T)	9.57	11.01	BRHRSKIS RH Software Slic Slicom (RHS002C)	6.61	7.60
BCASGRAO Acronsoft Graphics on the BBC	8.50	9.78	BCGGWORG Gemini Stock Control (ICS)	14.75	16.96	BCSHGBLT Simon W Hessel GB Ltd	5.13	5.90
BCASGRAP Acronsoft Graphs & Charts (SBX02)	7.35	8.46	BCGEWROD Graphic Research Minfield	5.13	5.90	BCSHINHE Simon W Hessel Intelligence	4.39	5.05
BCASHOOK A soft/ICL Hooked on Numbers (SBX08)	7.35	8.46	BCGHIMTA Honeydoly Advanced Basic course	12.10	12.71	BCSHTRAV Simon W Hessel Travel Game	4.39	5.05
BCASSHOPP Acronsoft Hooper (SBG23)	7.35	8.46	BCGHIMTON Honeydoly Beginners Assembly Language	12.10	12.71	BCSS2002 Superior Software 2002	5.87	6.75
BCASITALI Acronsoft Italian (Linkword) (SBX14)	11.05	12.71	BCGHNTUM Honeydoly Beginners Basic course	12.10	12.71	BCSSALID Superior Software Alien Dropout	5.87	6.75
BCASJARS Acronsoft Jars (SBE15)	8.83	10.16	BCGHNTSA Honeydoly's Mr T's Number Games	9.57	11.01	BCSSBATT Superior Software Battle Tank	5.87	6.75
BCASJCBO Acronsoft JCB Digger (SBG09)	7.35	8.46	BCGHNTSH Honeydoly's Mr T's Shape Game	9.57	11.01	BCSSCENT Superior Software Centipede	5.87	6.75
BCASLISD Acronsoft Lisp Demo Progs (SBL09)	7.35	8.46	BCGHNTTEL Honeydoly's Mr T Tells the Time	9.57	11.01	BCSSCOLD Superior Software Collditz Adventure	5.53	6.35
BCASLISP Acronsoft Lisp Cassette (SBL02)	12.45	14.32	BCGRMINA Graphic Research Minfield	5.13	5.90	BCSSCRAZ Superior Software Craz Painter	5.87	6.75
BCASMAGI Acronsoft Magic Garden (B) (SBX04)	7.35	8.46	BCGRDIBO Honeydoly Advanced Basic course	12.10	12.71	BCSSCRIB Superior Software Cribbage	5.13	5.90
BCASMEMB Acronsoft ICL Ship Manager (SBX06)	7.35	8.46	BCB0AHDQ Honeydoly Beginners Basic course	12.10	12.71	BCSSFAIR Superior Software Fairground	5.87	6.75
BCASMETE Acronsoft Meteors (SBG13)	7.35	8.46	BCB0BEGA Honeydoly Beginners Assembly Language	12.10	12.71	BCSSFROG Superior Software Frogger	5.87	6.75
BCASMICR Acronsoft Microtex (SBL04)	36.85	42.37	BCB0C37EN Honeydoly Beginners Basic course	12.10	12.71	BCSSFRUI Superior Software Fruit Machine	5.87	6.75
BCASMISS Acronsoft Missile Base (SBG18)	7.35	8.46	BCB0C8TRN Honeydoly's Mr T's Shape Game	6.59	7.58	BCSSGALA Superior Software Galaxians	5.87	6.75
BCASMISS Acronsoft Missing Signs (SBE09)	8.83	10.16	BCB10BAT Honeydoly's Mr T's Shape Game	9.35	10.75	BCSSHUNG Superior Software Hunchback	5.87	6.75
BCASMONS Acronsoft Monsters (SBG03)	7.35	8.46	BCB10BTRN Honeydoly's Mr T Tells the Time	9.35	10.75	BCSSINVIA Superior Software Invasion Vortex	5.87	6.75
BCASNUMB Acronsoft Number Balance (SBE08)	8.83	10.16	BCB10D0 Honeydoly's Mr T's Measuring Games	9.57	11.01	BCSMDDIS Simonsoft Osseassembler	5.87	6.75
BCASONEC Acronsoft One to Nine (SBX07)	7.35	8.46	BCB10D0 Honeydoly's Mr T's Money Box	9.57	11.01	BCSSP2002 Superior Software 2002	5.87	6.75
BCASPEAK Acronsoft Peeko Computer Pack (SBE02)	7.35	8.46	BCB10D0 Honeydoly's Mr T's Number Games	9.57	11.01	BCSSALID Superior Software Alien Dropout	5.87	6.75
BCASPERS Acronsoft Personal Money M'ent SB85	8.80	10.12	BCB10D0 Honeydoly's Mr T's Shape Game	9.57	11.01	BCSSBATT Superior Software Battle Tank	5.87	6.75
BCASPHIL Acronsoft Philosophers Quest (SBE01)	7.35	8.46	BCB10D0 Honeydoly's Mr T Tells the Time	9.57	11.01	BCSSCENT Superior Software Centipede	5.87	6.75
BCASPICT Acronsoft Picture Maker (SBX03)	7.35	8.46	BCB10D0 Honeydoly's Mr T Tells the Time	9.57	11.01	BCSSCOLD Superior Software Collditz Adventure	5.53	6.35
BCASPLAN Acronsoft Planetoid (Delender) (SBX15)	7.35	8.46	BCB10D0 Honeydoly's Mr T Tells the Time	9.57	11.01	BCSSCRAZ Superior Software Craz Painter	5.87	6.75
BCASROCK Acronsoft Rocket Raid (SBG05)	7.35	8.46	BCB10D0 Honeydoly's Mr T Tells the Time	9.57	11.01	BCSSCRIB Superior Software Cribbage	5.13	5.90
BCASSENT Acronsoft Sentence Sequencing (SBE07)	8.83	10.16	BCB10D0 Honeydoly's Mr T Tells the Time	9.57	11.01	BCSSFAIR Superior Software Fairground	5.87	6.75
BCASSINV Acronsoft Super Invaders (SBG16)	7.35	8.46	BCB10D0 Honeydoly's Mr T Tells the Time	9.57	11.01	BCSSFROG Superior Software Frogger	5.87	6.75
BCASSLISD Acronsoft Sliding block puzzles (SBG12)	7.35	8.46	BCB10D0 Honeydoly's Mr T Tells the Time	9.57	11.01	BCSSFRUI Superior Software Fruit Machine	5.87	6.75
BCASSSNAP Acronsoft Snapper (SBG04)	7.35	8.46	BCB10D0 Honeydoly's Mr T Tells the Time	9.57	11.01	BCSSGALA Superior Software Galaxians	5.87	6.75
BCASSNOO Acronsoft Snooker (SBG21)	7.35	8.46	BCB10D0 Honeydoly's Mr T Tells the Time	9.57	11.01	BCSSHUNG Superior Software Hunchback	5.87	6.75
BCASSPAN Acronsoft Spanish (Linkword) (SBX15)	11.05	12.71	BCB10D0 Honeydoly's Mr T Tells the Time	9.57	11.01	BCSSINVIA Superior Software Invasion Vortex	5.87	6.75
BCASSPAS Acronsoft S Pascal (SBL08)	12.45	14.32	BCB10D0 Honeydoly's Mr T Tells the Time	9.57	11.01	BCSSOVER Superior Software Overdrive	5.87	6.75
BCASSPHI Acronsoft Sphinx Adventure (SBG07)	7.35	8.46	BCB10D0 Honeydoly's Mr T Tells the Time	9.57	11.01	BCSSPONT Superior Software Pontoon	5.13	5.90
BCASSSTAR Acronsoft Starship Command (SBG22)	7.35	8.46	BCB10D0 Honeydoly's Mr T Tells the Time	9.57	11.01	BCSSQBTER Superior Software Qbert	5.87	6.75
BCASTREE Acronsoft Tree of Knowledge (SBE04)	7.35	8.46	BCB10D0 Honeydoly's Mr T Tells the Time	9.57	11.01	BCSSROAD Superior Software Road Runner	5.87	6.75
BCASWORH Acronsoft Word Hunt (SBE05)	8.83	10.16	BCB10D0 Honeydoly's Mr T Tells the Time	9.57	11.01	BCSSSPAF Superior Software Space Fighter	5.87	6.75
BCASWORS Acronsoft Word Sequencing (SBE06)	8.83	10.16	BCB10D0 Honeydoly's Mr T Tells the Time	9.57	11.01	BCSUBEEB Sulu Software Beebeater	7.35	8.46
BCBEAVEM								

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RX-80FT £225.25 + VAT



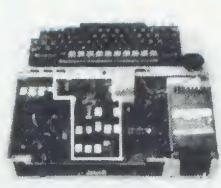
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Printer price includes cable for BBC and screen dump rom is available for £11.50

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3" Micro Disc £129.95
(inc. VAT)



Disc Interface &
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£198.95 (inc. VAT)

Micro Disc Drive for the BBC Micro

The Micro disc drive offers a method of low cost quick access to programs. The drive is essentially a small version of a 5½" disc drive and offers similar features to the larger drive.

The data is stored on a 3" disc, this is enclosed in a protective hard plastic cassette which features a write protect switch.

The micro drive requires the standard Acorn disc interface, but a new disc filing system rom. Acorn DFS may be exchanged for the micro DFS for £12.00. The new micro disc filing system can read and write to Acorn DFS discs.

Thus if a 5½ inch and a micro floppy were connected on the same cable files could be transferred between them.

Capacity: 80.64 K bytes Transfer Rate: 125k bit/s.

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FIRST BYTE

ELECTRON JOYSTICK INTERFACE

Printer Interface
OUT NOW
Uses normal BBC printer commands
No software required!



ELECTRON JOYSTICK INTERFACE

Electron users! This is the add-on everyone wants. It's the new Electron switched joystick interface from First Byte - available now with free conversion tape that vastly extends your game range right away.

The interface operates with all 'Atari-style' 9-pin joysticks, and its many advanced design features put it way out in front for quality and reliability. That's why, to date 15 major software houses are already bringing out games that work directly with the First Byte Electron Joystick Interface - and many more are sure to follow.

FREE conversion tape - play all these top games right now

Every Electron Joystick Interface comes with a free conversion tape, so you can use some of the most popular games around right now:

- Killer Gorilla
- Moonraider
- Positron
- Croaker
- Swoop
- Bandits at 3 o'clock
- Escape from Moonbase Alpha
- Cybertron Mission
- Cylon Attack

- Kamakazi
- Chuckle Egg
- Atom Smasher
- Alien Break In
- Birds of Prey
- Galaxy Wars
- City Defence
- Monsters
- Pool
- Pengwyn

- Lunar Rescue
- Bugblaster
- Blagger
- Bed Bugs
- Alien Dropout
- Daredevil Dennis
- Snooker
- Diamond Mine
- Vortex

The conversion tape also allows you to configure most other games for joystick control.

Games specially for the First Byte Interface

All these major software houses are bringing out games that work with the First Byte Electron Interface, with no conversion tape needed.

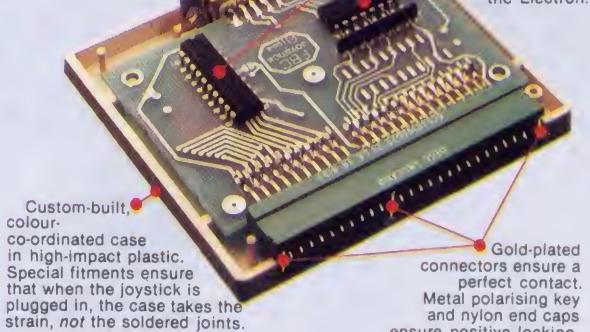
- | | | | |
|-----------------|------------|------------|---------------------|
| ● Alligata | ● Romik | ● Aardvark | ● Software Invasion |
| ● A & F | ● Bug-Byte | ● Optima | ● MRM |
| ● Program Power | ● Visions | ● Postern | ● Beebug-soft |
| ● Superior | ● Virgin | ● Phoenix | |

The First Byte Electron Joystick Interface - available now from all good dealers and W. H. Smith.

Look at these advanced design features.

Works with all 'Atari-style' 9-pin joysticks and utilises rapid-fire mode on Quickshot 2.

Only 2 chips for ultra-high reliability and low power consumption ensuring safe operation with the Electron.



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Concern over CES move to Acornsoft HQ

ACORN is to re-organise its educational arm CES—but managing director Chris Curry has set out to reassure the educational establishment about the future of the group.

CES (Computer Education Service) was taken over from ICL by Acorn last October and now the group is to move from Maidenhead to come under Acornsoft's wing.

The five programming staff have been asked to move to Cambridge, some having the option of jobs in Acorn International and staying in Maidenhead. The information officer has, however, been made redundant as her role is to be taken over by staff already in Cambridge.

Closer

Chris Curry explained: 'Educational software will continue to be the responsibility of CES, but the group will come under the aegis of Acornsoft management.'

'We are going to increase the scale of CES operations and put more people and money into CES. It must be closer to the body of the company to prevent duplication.'

Reputation

CES has gained a good reputation and established a close liaison with many schools, including providing people to help with courses.

Howard Curtis, chief examiner of 'O' level computer studies for the Joint Metrculation Board, told *Acorn User*: 'CES has my full support and I think it is a pity the changes have been made without consultation—and that they're losing a dedicated information officer.'

'Schools and advisers are crying out for help and CES is one of the bodies they look to. CES gives Acorn a friendlier face than exists within the rest of the company.'

Colin Monson, adviser for more than 400 schools in Berkshire, also expressed concern: 'Our contact with Acorn is through CES, as we have found it difficult to go to Acorn, and the dealers know little more than we do.'

Acorn focuses on video discs

ACORN is to set up a special group to develop its interactive video disc technology and keep the company's lead over Japanese competition.

An interface will be launched before the end of the year to enable the BBC micro to control video discs running on the Pioneer system. And in the spring a special unit will be released combining the BBC's intelligence with the interface and software.

Acorn MD Chris Curry told *Acorn User*: 'The interactive video centre will be run from the HQ of Acorn International in Maidenhead. It will concentrate on further development. There will be a promotional force to sell equipment and generate links with industry for training. Another team will create course material.'

'We have a good start in the field, but the Japanese are snapping at our heels.'

At present video discs can



Curry: 'Japanese at our heels'

only have information read from them, although Acorn's recent deal with BSR in Hong Kong aims to develop read-write laser discs. The great advantage of video over floppy and hard Winchester discs is their storage capacity.

Curry sees a big market for the present technology with interactive video, programs and data mixed on one disc.

Acorn first demonstrated a BBC micro controlling video

18 months ago at the BBC's exhibition in January 1983. The system controlled film of birds in flight and then asked questions which were answered on the Beeb's keyboard.

The BBC is already considering doing material for schools to back up TV series. Peter Bratt, producer of the *Science Topics* series said: 'The BBC is very interested in the possibilities of interactive video and the Acorn interface will make our life easier.'

'One of the *Science Topics* programmes is being considered at the moment as a high priority to base an interactive disc around. However it's not something we would rush at.'

'If we did go ahead it would be an important step and we want to get it right—not just illustrated CAL. We would want to take full advantage of interactive video.'

News for schools database service

by Geoff Nairn

NEWS International, owner of *The Times*, looks set to launch a 'dial-up' information service for schools.

A variety of educational news and information will be put on a large database which could then be accessed using a telephone and modem.

A trial service has been running using a closed database on Telecom Gold (British Telecom's electronic mail network), to send the information around the country.

If the scheme is given the go-ahead, a much-reduced subscription charge will have to be negotiated with BT to run on Gold, for the standard subscriber has to pay £100 to join and then a minimum of £10 per month—plus phone bills. The other option would be for News

International to set up its own computers to run the database.

The trials has been running in several schools for six months—although no-one will say where. In fact News International has refused to discuss the project at all. A final decision has yet to be taken on the format and extent of the scheme, but it would obviously be of immense benefit to schools and information technology in general.

Micronet stars

STAR NET is a space war game now on Micronet—with up to 1000 players at a time. Each move costs 10p, but there is a prize for the first emperor of the 3000-star universe.

Professionals on-line to DB

SPECIALISED 'dial-up' database services already exist in this country, but they are expensive to use. Eurolex caters for the legal profession, and enables lawyers to study the latest cases and access a library of more than 44,000 reports. In total, 300 million words of legal information reside in the computer data files. It can be accessed using Telecom Gold, or indeed by dialling an ordinary phone number; but at £75 an hour few amateurs would want to use it.

The British Library runs Blaise, which enables provincial libraries to see what books are held at headquarters. The Polis database is a computerised version of Hansard, the House of Commons' journal.

British and American news services have been using computers for some time. Reuters has a very successful database service for financial news and its reporters send in copy from portable computers.

THREE NEW PROGRAMS FROM MICROTEST

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Save time recording milk yield and calculating feed amounts!

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2 x 40 Track Drives Required or 1 or more 80 Track Drives. Please state which when ordering.

SATAN'S CHALLENGE or (Nevil Rides Out)



A Black Magic Adventure

Dare you take up the challenge laid down by the most evil and sinister of all beings... the devil himself! If you do you will find yourself alone and at the mercy of the twisted fancies and whims of a cold and calculating mind.

Occult forces are threatening the lives of those near and dear to you. Their only salvation rests in your hands but in accepting the challenge your own existence is put in severe peril.

In taking up the challenge you have to find The TALISMAN and locate a pentagram which then has to be prepared for the final rite. In the meantime dark forces will be opposing you making a difficult task almost impossible.

Do not allow yourself to be lulled into a sense of security for it will be short lived.

Many have gone before only to swell the ranks of the damned.

This is the latest adventure from the stables of Microtest and has been written with the acclaimed features of other adventures in mind eg save facility, quick response, simple but extensive commands, a mixture of logical and friendish problems to solve.

Be warned this is an easy adventure to get into but devilishly difficult to end.

Cassette £7.95 inc. VAT Disc £9.45 inc. VAT + p&p 50p

Disc 40 or 80 Track.

MICROTEST FONT ROM.

This exciting new ROM from Microtest will enable you to get all sorts of new characters and fonts from your BBC Computer. Once you have produced your masterpiece on the screen, all you have to do is use the inbuilt screen-dump utility to produce a hard copy on to paper.

Typing '*HELP FONTS' gives a list of available fonts and the blocks of characters which they replace.

Available fonts are:

*Accents	Accents and miscellaneous.
*Block	Small capitals.
*Data	Like the bottoms of cheques.
*Greek	It's all Greek to me too!
*Joined	Standard capitals with joined up lower case.
*Maths	A mix of until now unobtainable Mathematical symbols.
*Miscellaneous	A few oddities which often are very necessary.
*Thick	Thick text (for MODEs 0&3) to enhance 80 column mode.
*Thin	Thin text (for MODEs 2&5) which makes modes 2 & 5 much more readable or perhaps "READABLE".
*Vertical	For labelling graphs.

The ROM has a dump facility which will produce a screen dump of any MODE for 0 to 6 on an Epson, Star printer, CTI CP80 or MT80.

The ROM uses absolutely NO user memory and can be used with word processors etc. as well as normal BASIC programs.

**£17.50 inc. VAT
+ p&p 50p**

Microtest Starstick ROM & Joystick Package

Now available the Starstick ROM and Joystick. This comes in three forms:



Enables you to use our joysticks even on programs that do not offer joystick capability.

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(A) The Starstick ROM and Quickshot I Joystick
Price 17.95 + VAT = 19.84

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(C) The Starstick ROM and patch lead, choose your own Spectrum/Atari style joystick
Price 15.25 + VAT = 17.54

Post and Packing £1.00 inc. VAT per item

This enables you to plug the Rapid action self centring joysticks until now only available for the Spectrum/Atari/CBM machines into the user port of the BBC. Model A users please note NO ANALOGUE INTERFACE REQUIRED.

Disc Users Note - pressing BREAK, SHIFT-BREAK or CONTROL BREAK does not modify or destroy the STARSTICK software so Disc Users please feel free to Boot!

The software patch provided in the ROM is interrupt driven and adds the following commands to your computer.

- ★ STICK turn on the STARSTICK ROM
- ★ NSTICK turn off the STARSTICK ROM
- ★ SETSTICK set up joystick to users spec
- ★ SAVE 'NAME' 140 160 saves your user-key protocols
- ★ ADVAL emulate standard analogue joysticks
- ★ PAUSE define key to Freeze game
- ★ NPAUSE turn off ability to freeze game
- ★ 'NAME' predefined key protocols set up for software houses programs
- ★ HELP KEYS displays currently selected key protocols
- ★ REPEAT enables auto-repeat fire
- ★ NREPEAT disables auto-repeat fire

available from
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18 Normandy Way, Bodmin, Cornwall PL31 1EX
Telephone: 0208 3812
OR ANY GOOD DEALER

Large picture shows BBC Computer System and a Quickshot II Joystick. Small inset just a few of the joysticks that will work with the patch lead. Screenshot by kind permission of SUPERIOR SOFTWARE





Super Champ enters UK ring

THE Super Champ, claimed to be the top-selling joystick in the US for the last two years, is now available in the UK.

Its distributor, Dean Electronics of Ascot, says it has several features so far not available to UK games players: 10 feet of retractable cable; a contoured handle to suit both left and right-hand players; and a swivel base with suction cups for single-handed control.

It is compatible with the Electron and BBC B through an interface and costs £12.95 through high street stores or direct (£1 for p&p) from Dean Electronics, Glendale Park, Fernbank Road, Ascot, Berks.

The end for 'A'

THE BBC model A micro will no longer be sold from September 1984. This is, says Acorn, because it accounts for only a small percentage of BBC microcomputer sales.

Orders for the model A will be honoured up to August 31.

Sales of both models A and B since the launch of the BBC micro in 1982 now exceed 300,000 units worldwide.

Budget monitor

OPUS has launched a high resolution monitor that it claims costs about £100 less than its rivals.

It is a 14in RGB monitor manufactured by JVC and costs £279.39, including VAT, cable, delivery, manual and a year's guarantee.

Resolution is 580 x 470 and display 80 x 25.

Opus also markets a medium resolution monitor (370 x 470) at £221.89. Both are available from Opus dealers.

Indian schools to take Beeb micros in bulk?

INDIA could soon become Acorn's biggest overseas market - the jewel in the computer company's export crown.

Information Technology Minister Kenneth Baker has already held out the prospect to Parliament, predicting that the BBC micro is set to become the standard educational micro in Indian schools.

But what the Minister failed to mention was that the super-salesman whose efforts helped pull off the coup was... Her Majesty the Queen.

For it was her gift of half-a-dozen Eonet systems to the Indian President Zail Singh during the Royal tour last year that helped lay the foundations of this potentially huge export market.

A joint working party has already been set up between the Department of Trade and

Industry and the Indian government to examine the long-term provision of British micros.

The Beeb, though, is already doing very well in the Indian market - based on its success in providing the overwhelming majority of micros in the British government's schools scheme.

The growing overseas prospects are not confined to India however. More than 30 countries have sent educational teams to the United Kingdom to study how Britain has established its computer education programme.

The result, according to Mr Baker, is that Acorn and other companies involved in the schools scheme are now selling abroad 'in substantial quantities.'

The current Microcomputers in Schools scheme



Kenneth Baker: boasts success

is due to end in December.

The Minister told MPs: 'The scheme has undoubtedly been a success and we can rightly boast that we are, in terms of education, the most advanced in the use of computers.'

Now Department of Trade and Industry officials are looking at whether further support schemes are necessary.

#t#This short section of text illustrates some of the facilities available when typesetting with #it#TypeWise#ro# and the #it#Anvil System#ro#.

#bo#Typefaces#ro#
The new Wordwise print control codes IT (italic) and BO (bold-face) are used for *#it#italics#ro#* and *#bo#bold#ro#* respectively; ' and , followed by ^ or V produce *#v#superscript#v#* and *#v#subscript#v#* in the same way as Wordwise does using its OC codes on a full-function printer. The codes T(no.) and H(no.) are used to change text and heading styles, which may be any or all of type-size, type-face, line-advance, linelength, indents and justification.

Typewise example

Your text typeset

WORDWISE users can now have their text professionally typeset. The service, which lets you have direct control of such things as type font, type size and headings, is provided by Somerset company Wordsmiths.

With its Typewise system, the user has, in addition to the normal Wordwise embedded commands which set such things as margins and tab stops, extra 'typestyle' commands embedded in the text. These are ignored by Wordwise, but if a text file using these additional commands is sent to Wordsmiths, it will be typeset on their computerised

Anvil system. The cost works out at about 75p per 'k' of text.

A program called Read is available at £25 to complement the service. This will display your files on the screen with all the control codes highlighted. This gives you some idea of how the text is going to appear in print.

Wordsmiths has run the Anvil service for Wordstar users for about two years, and several computing books for the Beeb and Electron have been produced using it, including *Beyond Basic*. But this is the first typesetting service for a cheap wordprocessing package on a Beeb.

Switch on to amateur TV

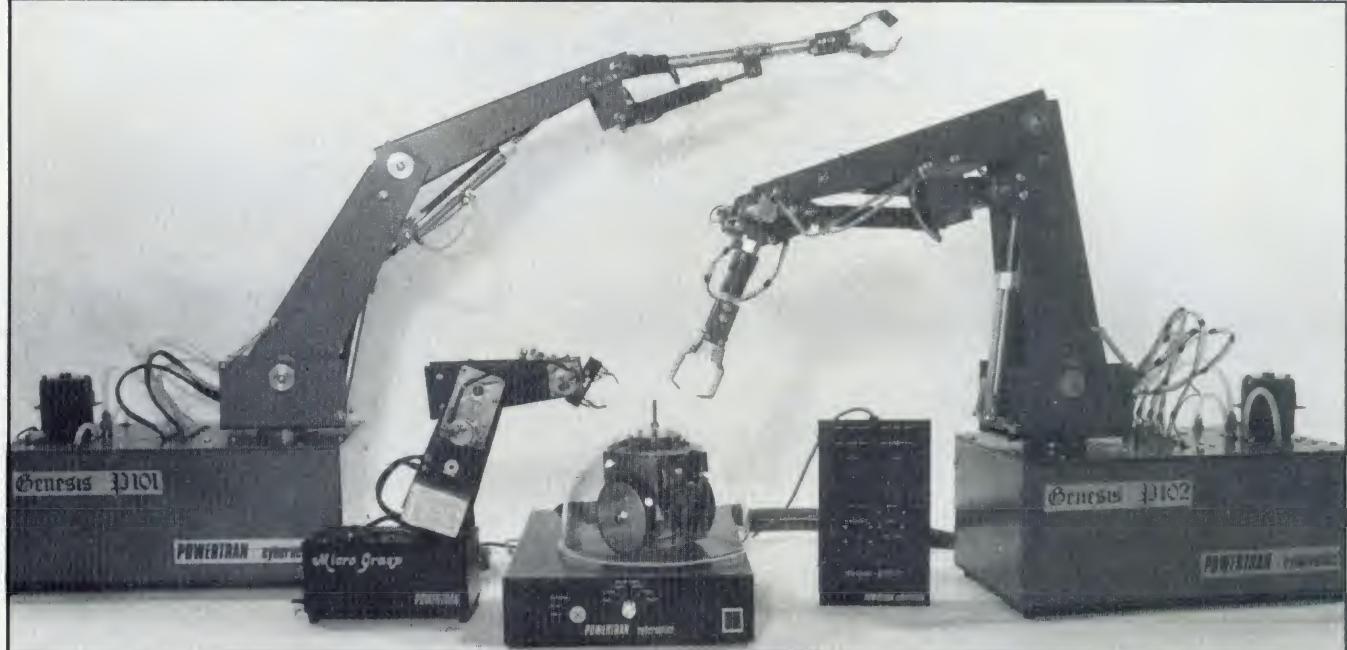
DESPITE the range of broadcast and cable TV services now available, it seems that some people are still not satisfied. Amateur TV, using the Slow Scan TV system, is becoming increasingly popular - especially among the amateur radio brigade.

One such 'ham', John Melvin, has developed an add-on for the Beeb which enables you to receive SSTV transmissions and display the pictures on the monitor screen.

The unit plugs into the Beeb's I/O port and comes complete with software and demonstration TV pictures.

Previously, the reception of SSTV required expensive equipment. At £93 - or £17.50 for just the construction details - John Melvin's solution is considerably cheaper.

For further information contact John Melvin at 2 Salters Court, Gosforth, Newcastle, or if you are a ham give him a call - his shortwave callsign is G3LIV.



Powertran robots, from left to right: Genesis P101 at £1700, Micro Grasp at £312, Hebot at £115, and Genesis P102 at £1200

CALLING all educationalists

THE use of computers is one of the most debated subjects in education, with little sign of a consistent policy in schools. CAL 85 is a symposium which hopes to alleviate the confusion.

CAL, computer-aided learning, means learning with, rather than about, computers. The meeting will take place from April 10-13 next year and will include workshops, lectures, exhibitions and demonstrations.

The organisers are keen to attract delegates from all levels of education and emphasise the desire to see participation from primary and secondary schools.

Readers who would like to give papers or have ideas for workshops should contact Richard Phillips at the Shell Centre, University of Nottingham NG7 2RD.

Z80 'gift' in Torch package

GCC is set to follow up its Starbase database software with a set of CP/M financial packages to run on the Torch Z80 second processor.

First is the *Sage* integrated accounts program which comes with the Z80 thrown in at £431. Next is a spreadsheet called *Cracker*, designed to work with 80-track, double-sided disc drives.

GCC has exclusive rights to implement *Sage* on the BBC micro, with customers getting a free Z80 for the price normally charged for the software alone.

Cracker was described by Barry Billingham at GCC as very friendly and more power-

ful than Perfectcalc. It will take DBase II files and should come in at under £200.

At the end of July an update to Starbase on disc will enable it to work with Computer Concepts' Wordwise word processing chip.

Later in the year, a memory board will be released which will hold up to four 8k RAMs and 16 ROMs.

The Z80 second processor supplied with *Sage* comes in a wedge-shaped box which is smaller than a standard disc drive. Included with it is a sideways ROM and the Torch CP/N operating system on disc. It connects by a single cable to the BBC's Tube interface.

Four ways to make a robot connection

FOUR robots from Powertran Cybernetics can all be connected to the BBC micro, although you'll need to be able to assemble them and write the software yourself.

Top of the range is the Genesis P102, which has a built-in microprocessor, memory and control box. It costs about £1700. A simpler version, the P102, is £500 cheaper. Both come with RS232 connections, but they are capable of being used on their own.

Micro Grasp is an electrically powered arm costing £312, and Hebot is a turtle at about £115. These prices include a special interface board which is configured for a Sinclair, but can be adapted for the BBC. These two plug into the user port.

The turtle includes collision detectors, retractable pen, flashing eyes and a horn! It also features two-wheel drive.

The Powertran robot kits are designed mainly for computer studies courses and as extensions of control studies. Assembly instructions and tips on programming the devices are included in the price.

Details from Powertran Cybernetics, Portway Industrial Estate, Andover, Hants SP10 3AA.

Adventurous line in learning

STORY is an educational program for children which enables them to write their own illustrated stories. As the text develops, certain keywords trigger off pictures displayed on the screen.

There are 64 pre-pro-

grammed pictures in the software, up to seven of which can be used in each composition. Once the story has been completed, it can be saved and printed out.

Story costs £7.50 from H&H Software on cassette. Disc ver-

sions are also available. The program comes with a 16-page booklet.

Readers with Concept keypads can help children develop shape and letter skills with two programs from LTS of Studley, Warwickshire at £9.95 each.

Reliable Original Microcomputer Software



Available from all good BBC Computer Dealers.

Available by Mail Order from Computer Concepts, 16 Wayside, Chipperfield, Herts WD4 9SJ.
Or by 'phoning with your credit card number on (09277) 69727.



TORCH UNICORN

Designed with a total expansion capability

The Torch upgrade will give you a sophisticated business/professional system. However it doesn't stop there — it gives you the potential to expand — an expansion that no other current system can offer. Today, (not promises of 'one day'!), we are able to offer Hard Disc capability, networking of up to 254 machines, right up to the extra processing power of a 68000 32bit processor with 256K RAM, and optional UNIX operating system. **The potential is here!** The TORCHNET system, (software is included with all systems!), is a cost-effective method of linking office computing equipment in a simple and expandable fashion. TORCH means communication, whether it is inter-room communication, automatic 'home-to-office' communication, or electronic mail allowing a Torch user to initiate telex transfers, send tele-messages, use Electronic Mail (e.g. Telecom Gold), and talk to large mainframes. — **The potential is here!** Hardware is of no use without a suitable range of software, and the Torch can choose from a massive range of business, financial, application and language software. (Did you know that the Torch system has five times more software available for it than the IBM PC!) Why not contact us for your requirements?



TORCH BBC ADD-ON PRODUCTS

TORCH Z80 DISC PACK

The proven upgrade for the BBC Micro. Comprising 2 x 400K disc drive, Z80 processor with 64K of memory, and a CP/M compatible operating system. The system is supplied complete with the PERFECT software range including PERFECT WRITER, PERFECT SPELLER, PERFECT CALC, and PERFECT FILE. Full TORCHNET software is also supplied allowing sophisticated networking between other units.

**NEW TORCH Z80 PACK PRICE £699.
SOFTWARE PACKAGE INCLUDES Z80 BASIC**

The TORCH Z80 SECOND PROCESSOR CARD — for those who already have suitable disc drives. The card is supplied with all the free perfect software and Z80 basic, as detailed above, presenting a very attractive package. £299.

VIDEO DIGITISER

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Converts your BBC into a fully fledged Teletext Terminal. In addition to normal reception of Teletext pages, it is able to 'download' software as well as saving standard pages on any of the four TV channels. £196.

Continued on page ...

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Our current version of the highly popular Eprom programmer is now being enhanced to provide more and better facilities for easy programming by the user. The software will maintain its superiority over all currently available similar programmers. The range of eproms handled has been widened, to include

the eproms with lower programming voltage and eproms which can be programmed using algorithm. Control of all operations has been moved to the keyboard. The screen display has been improved to give more information. The screen editing facilities have also been modified to simplify the data entry.

Preliminary Information

- The new Eprom Programmer will now program 2516, 2532, 2564, 2716, 2732, 2764, 27128 and 27256 + 5v eproms, and all but the 27256 in a single pass.
- The programmer will be supplied with integral power supply, and interfaces with the BBC via the 1MHz bus. It is fully buffered and complies with Acorn protocols. There is no power drain from the computer.
- No knobs or switches to fiddle with — total control from the keyboard**
- Fully software driven with easy to understand instructions displayed on the screen.
- Eeprom type selectable from the keyboard**
- Selectable programming voltage 25/21/12.5V

- Defaults to normal programming with high speed algorithmic programming selectable, for a device with suitable capability.
- Continuous screen display of eeprom type, option and address range selected.
- Full screen editor with HEX or ASCII input. Constant display of logical eeprom address and the actual ram address.**
- Can read, blank check, program and verify at any address/addresses on the eeprom.
- Full Tape/Disc filing facility.**
- Several basic programs can be entered on a single eeprom and called up with individual name.

EPROM ERASERS



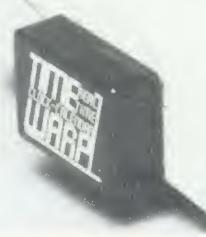
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- * See our other advertisement on page 14

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Action in Olympia

THIS year's Acorn User Exhibition, to be held at Olympia on August 16-19, looks set to easily top last year's show, with 35,000 people expected to pass through the doors.

About 140 exhibitors have booked stands, so there should be something for everyone. As you might expect, Acorn Computers will be there in force, as will your's truly *Acorn User* with a problem clinic for readers.

The education sector will be well represented with many familiar names—and quite a few new ones. ASK, Golem, Edsoft and Softcentre will represent the educational 'cottage industry', with MUSE and MEP as the Government-backed 'heavyweights'.

In among the usual plethora of peripheral suppliers are to be found several new products. Microware will be showing a new range of Epson 5½in disc drives; and Silicon Disk, the RAM alternative to disc drives, will be available at a discount from Solidisk.

Two new modems will be putting in an appearance at the show. The first, the Nightingale, runs at 300, 1200 or 1200/75baud and so can access bulletin boards, Prestel and Telecom Gold. It is being marketed by Pace.

Even more interesting is the Loco Systems SCM 100 modem. SCM stands for Software Controlled Modem—in other words, a ROM chip that plugs into your Beeb to control the modem directly. The beauty of this is that there are no controls on the modem itself—the software automatically selects such things as baud rate and protocols depending on the service you've dialled. As they say, 'Approval is being sought' for both these modems.

With the arrival of Acorn's

Geoff Nairn reports on the big stories to emerge—so far—from the Acorn User Exhibition: amazing modems, sprightly advances and software that exploits the 6502 second processor.

Plenty of peripherals and the programs to put them into action will be receiving their first public showing.

Arm-in-arm with a robot

R2D2—that lovable whistling dustbin from the film *Star Wars*—is rumoured to have his heart set on going to the Acorn User show.

Tony Dyson, the robot's maker, runs a company called Droid Factory which, from making promotional robots, has now gone down-market with a £400 robot arm for the Beeb. (Unfortunately R2D2 will not be for sale.)

As well as R2D2, Tony was also responsible for the robot seen showing John Cleese a thing or two in the recent Sony adverts on television.

The robot arm is based on an industrial version and is claimed to consume very little power as it uses servo motors rather than stepper motors. It also has inter-changeable



fingers which, although embarrassing to humans, is a plus point for robots.

R2D2, when asked to comment on Tony's latest protege, could only whistle '!!!??!

Ultra the android is the Droid Factory's latest offering at Unit 14, 70 Wooton Rd, Abingdon, Oxfordshire.

6502 second processor for the Beeb, the race was on to see who would be first to produce software which properly exploited it.

Well, Cardiff Micro Software has come up with a disc-based database program called Datafile which uses the second processor to store up to 3000 records on a double-sided, 80-track disc. Unusually, there is

also a version which runs on Eonet.

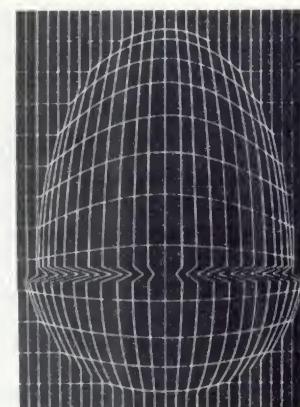
Simonsoft is using the Exhibition to launch its new series of Beeb games. They concern Oz the caveman. Simonsoft also will be demonstrating Sprites Version 2—an animation package which can produce an 18-fold increase in speed over normal Basic.

The Educational Software

The games are: *Killer Gorilla*, *Rouble Trouble*, *Stock Car*, *Frenzy*, *Block Buster*, *Ghouls*, *Jet-Power Jack*, *Felix in the Factory*, *The Mine*, *Cybertron Mission*—and one other to be launched at the show.

These discs and the rest of the range will be available only on mail order after the show (postage 55p extra).

Company has some new programs for the Robin Lightpen, which talks as well as draws.



15

AMS lets mouse loose

ADVANCED Memory Systems is set to let loose a pet mouse at the Acorn User Show. But before the Olympia officials call in a pest control officer, we should say that this mouse is of the non-furry variety.

AMS, who were first with the 3in disc drive, have now pulled off a similar coup with the first 'mouse' for a home computer. A mouse is a small hand-held box which, as you move it around the desk top, moves a pointer on the screen. Up to now only business machines such as Apple's Lisa have used mice; now the Beeb gets its own mechanical rodent.

AMS claims any program can be converted for use with the £70 mouse, in much the same way as a joystick. Four main uses are envisaged: word-processing; on-screen editing of programs; games; and graphics.

Company has some new programs for the Robin Lightpen, which talks as well as draws.

The show runs from August 17-19, 10am to 6pm (5pm on last day). On Thursday 16th, times are 10am to 7pm, with the morning reserved for the trade. Tickets cost £2, or £1 for under 16s.

For details of bulk discount tickets and the Exhibition, contact:
Computer Marketplace Exhibitions, 20 Orange St, London WC2H 7ED.

Micropower packs 'em onto disc

MICROPOWER is to make disc versions of its best-selling games available for the first time at the Acorn User Exhibition.

The top 11 will be on 5½in discs at £9.95 each that run on 40 or 80-track drives. For those who have the games on cassette, there will be an exchange service. The company will swap a cassette for a disc for £4.95.

star ATTRACTIOnS

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ADD 40 COMMANDS TO BBC BASIC WITH ONE ROM

GRAPHICS SCALE is a powerful and totally flexible statement that allows the user to take control of the scaling of the screen. Integers, real numbers and variables can be used.

ROTATE is used to 'rotate' the axes about a point and by an angle both defined by the ROTATE statement on a scaled screen.

CIRCLE and ELLIPSE allow a multitude of shapes to be drawn using a single statement, including:- any regular polygon, circles, arcs, solid sectors, triangles, squares, etc.

FILL is used to 'fill' a previously drawn area, with CFILL setting the colour/pattern/shade within pre-drawn bounds.

TRANS is used to translate the scaled area across the screen by the use of cartesian co-ordinates, subsequent graphics commands making use of the now displaced scaled area.

Plus: SMOVE, SDRAW, SPLOT and UNSCALE.

Compatible with: Acorn DFS, Amcoff(Pace) DFS, Watford DFS, Wordwise, Disc Doctor. Model B, BASIC 1 or 2, OS 1.20

4
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1

LLIST can be programmed, unlike LIST, and under the User's control, multiple statement lines can be split up into their component parts allowing for greater ease of reading. LGOTO is similar to the GOTO statement but more powerful in that it enables the user to jump to 'labelled lines' allowing for neater and more readable programmes. SORT allows the user to sort all or part of a string array into alphabetical order using a single statement. Invaluable for data processing.

SETWIN and WIN allow the user to define, using SETWIN, and display, using WIN up to seven complete windows on the screen. The user being able to select and return to previously defined windows at will, the cursor maintaining its last used position within that window.

Plus: OPT, POFOR, POFOS, POPREP and ADDCOMM.

GENERAL

ADDCOMM

Plus: *HELP displays the full syntax of all commands. Price includes a detailed ring-bound User Guide.

LOGO LMOVE is used to position the LOGO cursor, usually used prior to further LOGO statements. ANGLE is used to set the intended direction of the LOGO cursor, the angle being described in degrees. ADVANCE is used to move the cursor in the direction as set by ANGLE by the distance described in the ADVANCE statement. TURN gives the cursor a new direction by turning it a certain number of degrees anti-clockwise from its previous direction. PEN defines the kind of trail left by the LOGO turtle using the internal plot codes. LCIRCLE and LELLIPSE are the LOGO equivalents of the similar enhanced graphics commands, the shape centre being the current LOGO cursor position. LPOS is used to return the position of the LOGO cursor from a SCALEd screen.

These commands are unlike those on any other ROM, since they are used in exactly the same way as the standard BASIC commands - i.e., any numeric/string expression, multi-line statements, access to any variable, and, of course no stars!

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CHAR is a simplified 'character' designing facility using an enlarged grid that enables the user to quickly and easily construct or alter graphic and pseudo-alphanumeric characters. COMPACT is used to reduce the size of all or part of an existing program by intelligently appending lines together. FIND is used to search all or part of a program to find any desired character or set of characters. GREP and SREP are two related commands that enable the user to replace a character or group of characters with any other character or group of characters, under total control of user. LVAR is used to list all, or alphabetically selected, variable names currently within memory. VERIFY is a simple command to confirm that a copy to tape or disc is exactly the same as the original program in memory.

Plus: MEM, GOODPROG, KILLREM and FKEYS.

TOOLKIT

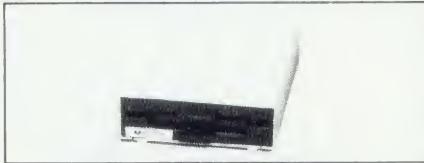
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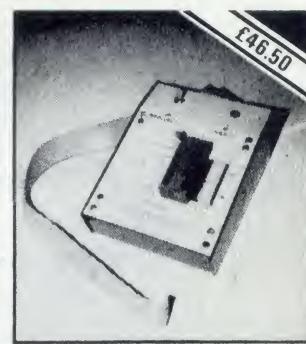
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Beeb in GLC competition

A BBC micro game has taken joint first place in a Greater London Council competition. The idea was to design a video game which would successfully get across the GLC's anti-racist message.

Competitors had a free hand over the type of game – but it had to include an anti-racist quiz consisting of 12 questions – for example, 'How many black people live in London' – before the game itself could be completed.

Ian Lambert's entry for the Beeb featured that familiar sight around London, the red double decker bus.

Ian is pictured receiving his cheque from GLC Leader Ken Livingstone.

Also in the picture are his son Ivan, Paul Boateng, vice-chairman of the Ethnic Minorities Committee, and John Carr, chairman of the Staff committee.



18

Scientific suites

TWO companies have set out to provide software for scientists and engineers on the BBC micro.

Crecy Computer Systems is aiming a suite of programs at energy engineers and managers. The initial package has five parts, concerned with fuel, boilers, steam and steam turbines. A second unit on heat recovery is under way.

The pack is designed for

people who have no experience of using computers and will run on a model B. It costs £45 on disc, including manual, from Crecy at 148 Liverpool Road, Penwortham, Preston.

Finersoft has released *Bstat*, which, as the name suggests, deals with statistical analysis.

Bstat costs £15 from Finersoft at 30 Edna Street, London SW11 3DP.

It's official – a Prestel adaptor

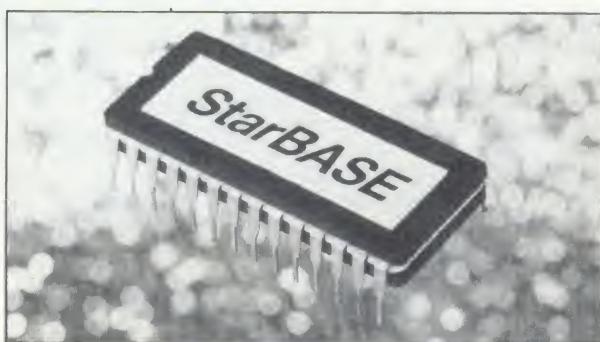
A VIEWDATA interface that links the BBC micro to Prestel and the electronic mail services has been launched by Acorn.

The Prestel Adaptor connects the Beeb directly to the telephone network, turning it into a powerful two-way computer terminal. The system can then automatically dial-up and access remote computers, including the Prestel and Telecom Gold facilities (if you've got the software).

It plugs into the RS423 port on the micro and the modern Type 600 BT telephone socket. The unit operates in full duplex mode, baud rate 1200/75.

The adaptor costs £113.85 (inc. VAT), and comes complete with a viewdata telecomm ROM and user guide. It is available only by mail order from Vector Marketing, London Road, Denington Estate, Wellingborough, North Hants NN8 2RL.

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Introducing BEEBUGSOFT

Until recently a very special range of applications and utility packages for the BBC micro has been unavailable to the general public.

This software has been produced by the BBC user group BEEBUG for its members. BEEBUG members tend to be a demanding and discerning group of individuals; and the range of software produced has been kept to a consistently high standard through their constant vigilance.

As a result, BEEBUG software is highly acclaimed amongst BEEBUG's 25,000 members. Independent reviews from the major computing magazines seem to take a similar view of the software, as you can see from their comments.

SPELLCHECK

The disc based spelling checker for text created on Wordwise or View.

"... invaluable ... fast and reliable ... a worthwhile investment"

PCN February 1984

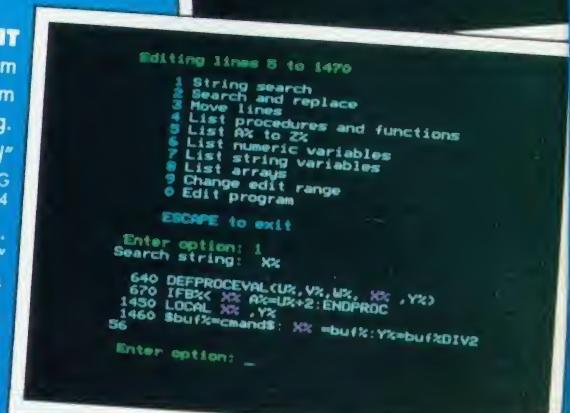
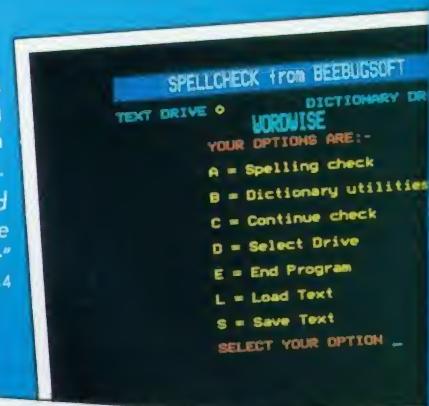
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"... worth every penny ...
highly recommended"
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"... its range of utilities is
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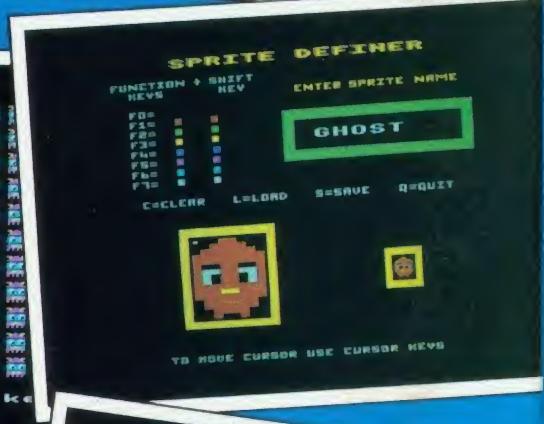
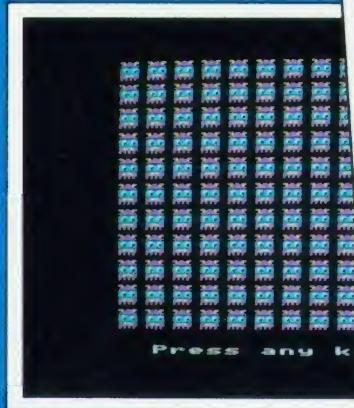


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May 1984

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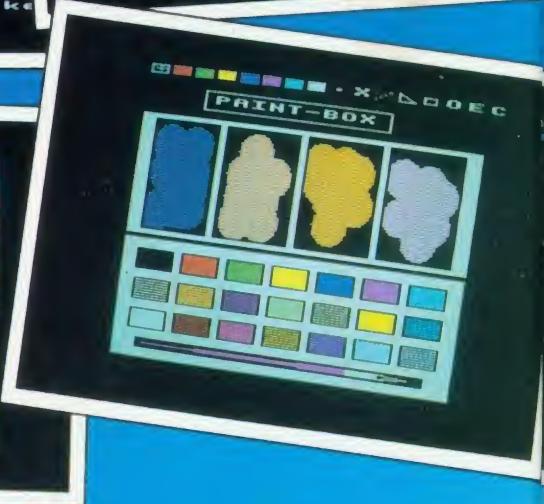
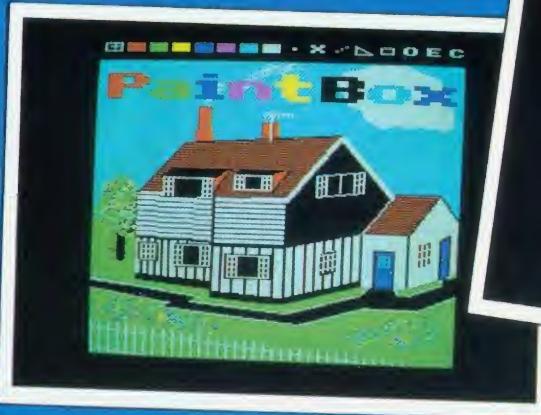


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... tremendous potential"
EDUCATIONAL COMPUTING Jan 1984

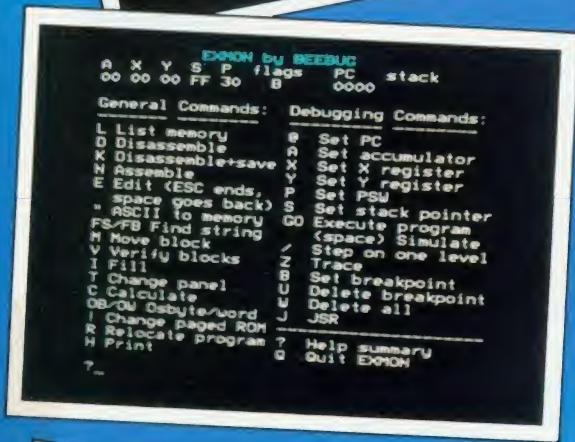
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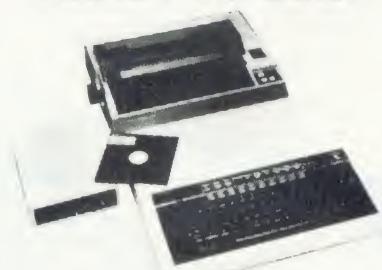
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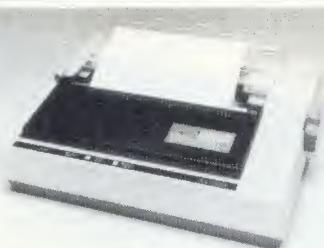
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|| DOWNLOADING WEATHER ||

27

The outlook is bright for Beeb users to receive satellite pictures, says Robin Mudge

SITCH on the TV in the early evening and you are bound to see one of those magnificent satellite pictures the weather men are so fond of. They are taken by satellites continuously orbiting the earth to help meteorologists study the world's climate, and predict our weather. The equipment they use is exorbitant, but now, using the BBC micro and a few peripherals, you can receive and display pictures broadcast by the American NOAA and Russian Meteor satellites.

Their orbits almost pass over the North and South poles and they take about 102 minutes for each revolution, during which time the earth turns about 25.5 degrees so each time the satellite goes round it looks at a different part of the globe. In this way a complete picture of the earth is built up in strips, each one slightly overlapping the last (figures 1 and 2).

The satellite takes two pictures side by side, one with visible light and the other with infra-red, as shown on page 29. The satellite spins rapidly and special equipment on board scans the earth's surface and sends a TV picture at 120 lines a minute, ie one line in half a second. This is a slow scan picture, when you consider that a domestic TV scans 625 lines in 1/25th of a second. Each scanned line is split into two, one part representing the infra-red and the other the visible light pictures and an FM radio signal is transmitted from the satellite on 137.5 MHz or 137.62 MHz.

Receiving the satellite signal is reasonably straightforward using professional receivers, or amateur versions costing far less: a suitable kit can cost as little as £50. Basically the receiver is little more than a modified domestic FM radio. A suitable crossed dipole aerial can also be bought, or



Figure 1. Consecutive orbits

made from an old BBC1 TV aerial.

The picture information is carried by a 2.4kHz audible tone which changes with the brightness of the image: louder for the bright parts. This tone is used to

MICHAEL Furminger uses the BBC micro at Nene College in Northampton to download weather satellite information for his courses. It all started as part of a combined studies degree which covered metrology.

Michael explained: 'I picked the idea up and then along came the BBC micro with its interfaces and graphics. We then built a fast A/D converter, wrote the software and away we went.'

The weather pictures are used to give a day-to-day illustration of current weather patterns, and hence simple short-term forecasting. Over a longer period, the pictures saved build into an information base for further analysis. One of the major advantages is that the infra-red scale gives a very clear indication of weather patterns, as the hot and cold fronts show up very well.

And the idea has caught on: 'It has been taken up by many colleges and universities who have all built working models. I even had a call from Jodrell Bank!'



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The 2nd Official Acorn User Exhibition

OLYMPIA AUGUST 1984

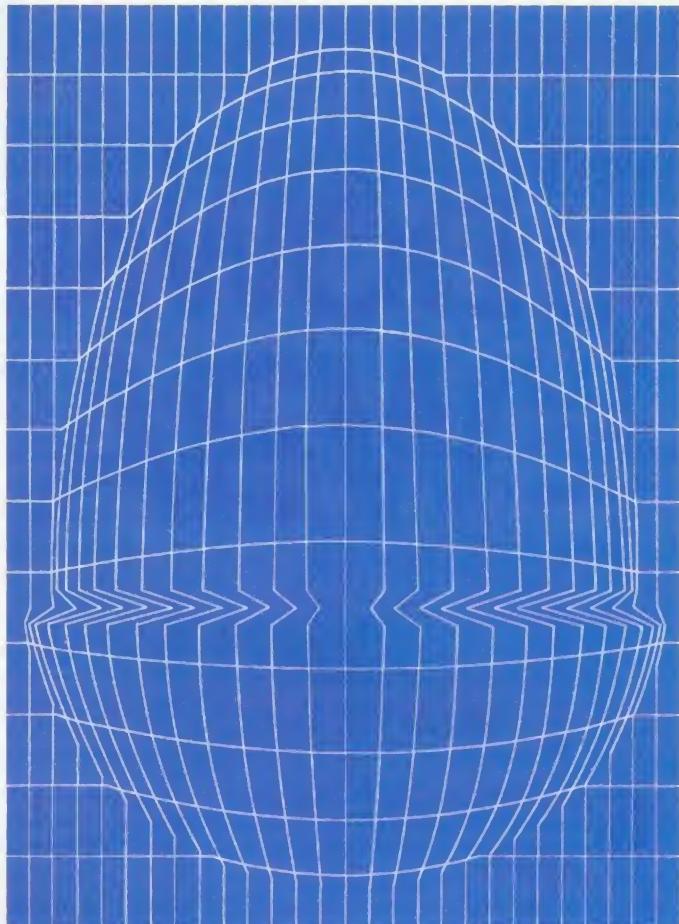
Thursday 16th – 10am to 7pm

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* Please note 10am to 2pm on Thursday 16th
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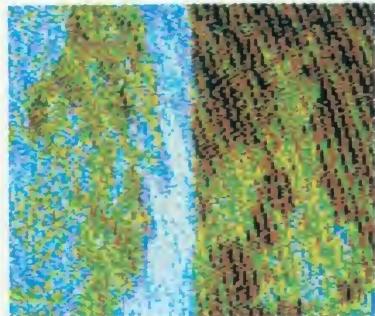
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drive a facsimile (facs) recorder. In these machines a piece of light or heat sensitive paper is wrapped around a rotating drum and an image is exposed or burnt onto it by a scanning light or heating diode.

The transmission of facsimile pictures itself isn't new because the BBC used to transmit them in 1934 but the facs kits were expensive even then. Today a facs recorder can cost many thousands of pounds and this is where the BBC micro comes in, as with suitable software it can display a very good picture.

Michael Furminger from Nene College in Northampton has designed an excellent system which uses the BBC micro to display satellite pictures instead of an expensive facs recorder. He supplies the circuit diagrams and software for the project for only £5. His project breaks down into three parts: an accurate clock; a fast analogue to digital converter; and suitable software for the BBC micro.

The first two are construction projects. The clock is needed to synchronise the start of each picture line. Looking at the diagram of the received satellite waveform you will see two large pulses, one at the beginning and the other separating the two pictures (figure 3). These are synchronising pulses. The software has to accurately line all of these pulses one under each other to produce a square picture. If this is not done properly the picture can skew to left or right causing distortion. The clock is crystal controlled and produces accurate 2Hz pulses which the software uses to synchronise the lines. It is much easier to record the satellite signals on a stereo cassette or reel to reel tape recorder with the clock pulses on another track so they can be passed through the BBC micro at a much more leisurely rate after the satellite has passed.



The satellite takes two pictures side by side

Before the computer can display a picture the 2.4kHz analogue signal has to be turned into a digital one. Each line takes just half a second, which is too fast for the BBC's internal A to D converter (ADC). An external ADC with a

very fast conversion time is needed and the signal is passed on to the Beeb's user port along with the 2Hz pulses from the other tape track.

The software produces a picture in either mode 1 or 2. In mode 1 a picture with resolution 320 by 256 pixels and four colours is produced, and in mode 2, 160 by 256 and eight colours. The software presents you with a menu allowing you to select a screen mode that displays a good black and white image, or a colour range designed to show different temperature bands on the infra-red picture. A picture is slowly built up on the screen as data is converted from the tape recorder. The image-producing routines run in machine code as Basic is not fast enough to process the data from the high speed ADC. Of course the software does a lot more than this as it corrects the geometric distortion found in the raw unprocessed pictures, which look like tall thin strips with all the land features highly squashed. Other programs in the package allow you to store

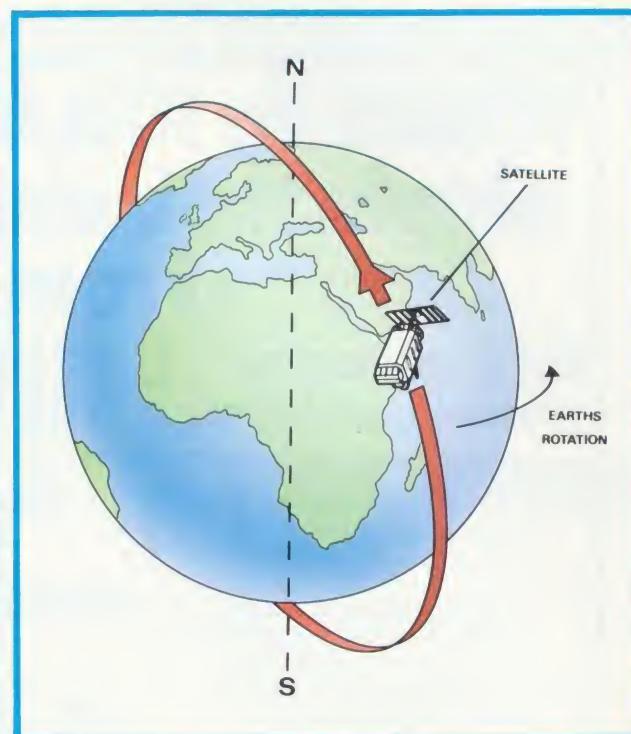


Figure 2. During the 102-minute orbit the earth turns about 25.5 degrees

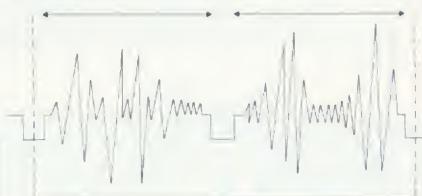


Figure 3. Received satellite waveform, showing synchronising pulses



Picture transmitted by the American polar-orbiting weather satellite Tiros-N

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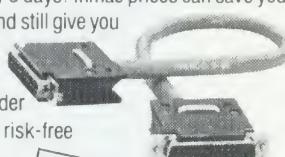
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pictures and view them at will and there is also a prediction program that helps tell you when the satellite is going to be overhead within receiving range—usually just two or three different times each day. Proper prediction tables can be purchased from the NASA Information Bureau.

The only disadvantage of Michael's package is the fact that the constructional details for the clock and high speed analogue to digital converter are limited to a schematic circuit diagram. You will have to make a hard-wired version or design an appropriate circuit board, but what can you expect for £5?

David Duff also has written software to turn the BBC micro into a weather picture display using the Unilab computer interface which has a built-in, high speed A to D converter.

Whichever system you choose to use you must get a letter of permission to receive weather satellite pictures from the Radio Regulatory Department of the Home Office. If you don't fancy the construction work and haven't got any friends who know which end of a soldering iron is hot, then you can buy a complete system for receiving weather satellites for about £2,100.

Hardware contacts

Receivers

Ambit International,
Parks Lane,
Broxbourne,
Essex.

Supply a kit to make a satellite receiver at about £50.

Microwave Modules,
Brookfield Drive,
Aintree,
Liverpool L9 7AN.

Supply a ready-built satellite receiver for £345 and also make a converter that changes the 137MHz to 30MHz which could be received by a modified CB radio.

Feedback Instruments,
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Make an entire receiving system including display for £2,100.

Aerials

Jaybeams,
Kettering Road North,
Northampton NN3 1EZ.

Supply a full range of aerials including one suitable for satellite reception.

Software contacts

Michael Furminger,
Nene College,
St George's Avenue,
Northampton.

Michael supplies a complete set of instructions to build the hardware, and the software necessary to receive satellite pictures for £5.

A copy of David Duff's listing to receive satellite pictures with the Unilab computer interface is available for 50p and a stamped, addressed envelope from *Acorn User*, 68 Long Acre, London WC2E 9JH.

References

'BBC weather satellite display', by M Furminger, *Electronics and Computing*, July 1983

Reception and processing of Tiros-N weather satellite telemetry by J Gilbert and T Terrell

'Meteosat high resolution images', by M Christieson, *Wireless World*, August 1982

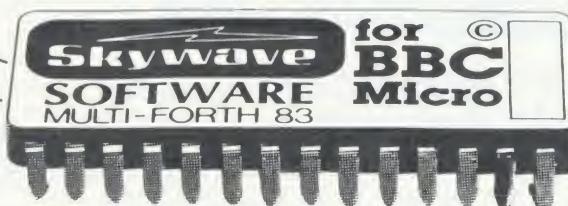
NOAA Handbook, available from the US Dept of Commerce, National Earth Satellite Service, Washington DC 20233

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Multi-Forth 83 sits in the sideways ROM area of the BBC along with any other ROMs in use. It is compatible with the MOS, and specially vectored to enable a system to be reconfigured. It contains a Standard 6502 Assembler, a Standard Screen Editor, and a Unique Stack Display Utility.

With this Forth, David Husband has provided the BBC Micro with capabilities never before realised. And being 16K rather than 8K is twice the size of other versions. Multi-Forth 83 is supplied with an

extensive Manual (170 pages plus) and at £45 + VAT it is superb value.

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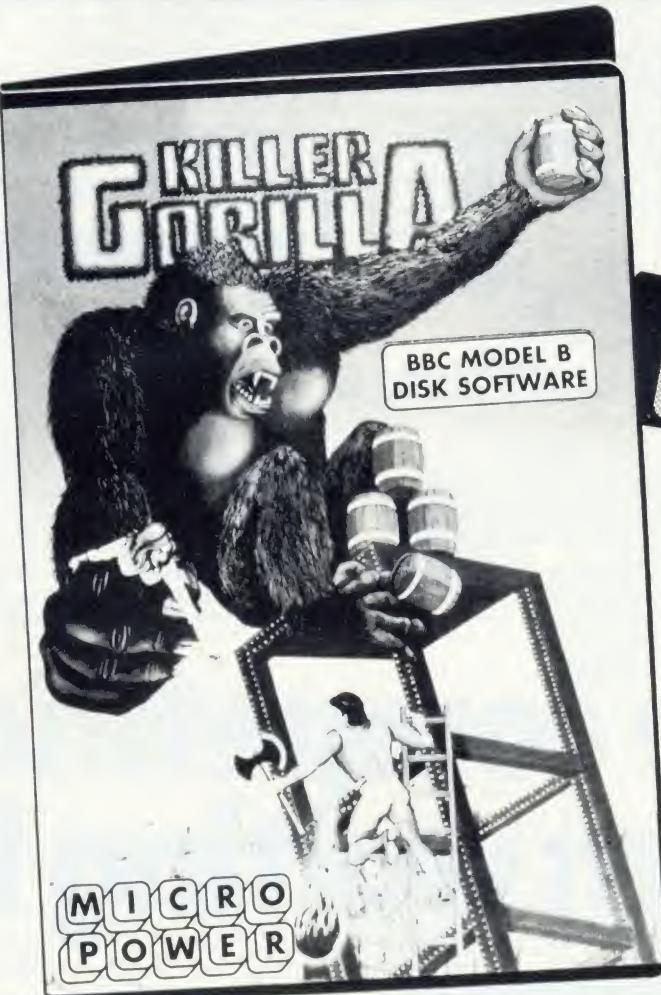
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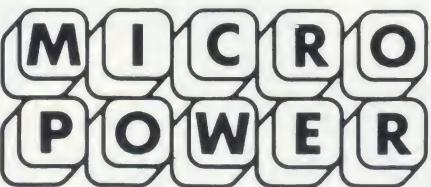
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KEYBOARD BASICS



APART from the actual process of learning to program, the keyboard can be one of the biggest obstacles to using your computer. If you've ever used a normal typewriter, you should have few problems, because there are few differences. On the other hand, if you have never used one then you must endeavour to learn your way around the keys. This takes time, and can be frustrating as no doubt you'll be in a hurry to get a program running. However, speed, two, three and even four fingers will come, eventually!

The keyboard on your Electron or BBC is often referred to as a 'QWERTY' keyboard. This isn't a fancy abbreviation, but simply denotes the fact that these are the first six letter keys (see photograph).

The major difference on the Elk's keyboard to a typewriter is that it doesn't have a return lever to take the typing carriage back to its start position on reaching the end of a line. Being more like an electric typewriter, the computer has a special key to do this, called the RETURN key. This is at the far right of the keyboard. Try pressing this a few times and you should see it perform a carriage return which scrolls (moves) the screen and any text on it up by one line, with any text at the top of the screen moving off of it and a new blank line replacing it at the bottom. Try it!

Now type some of the letter keys, try QWERTY for example. This will appear on the screen as the letters Q,W,E,R,T and Y. These are all capitals, or 'upper case'. However, just like a normal typewriter, it is possible to type each letter as a lower-case character. To do this you need to tell the Elk by pressing two keys at the same time. The keys are those marked SHIFT and CAPS LK and you'll find these on the extreme left. If you do this correctly the small yellow light next to the CAPS LK key will be extinguished. Try typing QWERTY again, this time it will appear as q,w,e,r,t and y! To get back to upper-case, press the same two keys together again, now the small yellow light will come on again. In most instances, a computer program must be written in upper-case characters as this is how the Elk recognizes program commands. If you only wish to type in a single lower-case character without leaving the upper-case mode, you can do this simply by holding the SHIFT key

The keyboard can be a great obstacle to learning about your micro. Tessie Revivis' program will set your fingers tapping

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down and pressing the key you require in lower case.

The number keys all have a black symbol above them. For example, above the 1 key there is an exclamation mark (!). These are the characters that can be printed using the SHIFT-CAPS LK sequence first of all. Try printing a few, then come back to the normal unshifted mode. If at anytime you can't get back to normal capitals, then remem-

ber you can always reset the Elk by pressing the BREAK key.

On the front of most keys you will probably have noticed the red coloured printing. On the letter keys these are in the form of words which relate to Basic commands, the instructions used by the Elk. Not every single command is available on the keys, there are too many and not enough keys, so only the more frequently-used ones are found

```

10 REM *** RANDOM PROGRAM GENERATOR ***
20 REM *** FOR ELK AND BBC MICROS ***
30 MODE 6
40 VDU19,0,4;0;0;
50 PRINT SPC(6); "RANDOM PROGRAM GENERATOR"
60 PRINT 'SPC(4); "(c) Acorn User August 1984"
70 PRINT "'Save this program on tape first'"
80 PRINT "Now type NEW <RETURN>"
90 PRINT SPC(8); "and then AUTO<RETURN>"
100 PRINT "Now hit function key f0 and then"
110 PRINT "hit the other function keys, f1 to f9"
120 PRINT "as often as you like!"
130 PRINT "When you get fed up press ESCAPE"
140 PRINT "and then RUN the program"
150 PRINT "to see your master creation!"
160 *KEY0 MODE 5IM
170 *KEY1 SOUND 1,-15,RND(200),RND(20)IM
180 *KEY2 MOVE RND(1000),RND(1000)IM
190 *KEY3 PLOT 85,RND(1000),RND(1000)IM
200 *KEY4 GCOL1,2IM
210 *KEY5 DRAW RND(1000),RND(1000)IM
220 *KEY6 GCOL2,3IM
230 *KEY7 COLOUR RND(4):PRINT "HELLO"IM
240 *KEY8 GCOL2,2IM
250 *KEY9 SOUND1,-15,RND(100),10IM

```

Listing 1. Just type in and RUN this program to create other programs!

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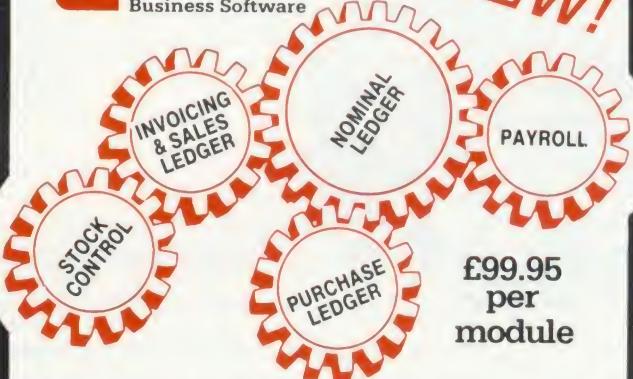
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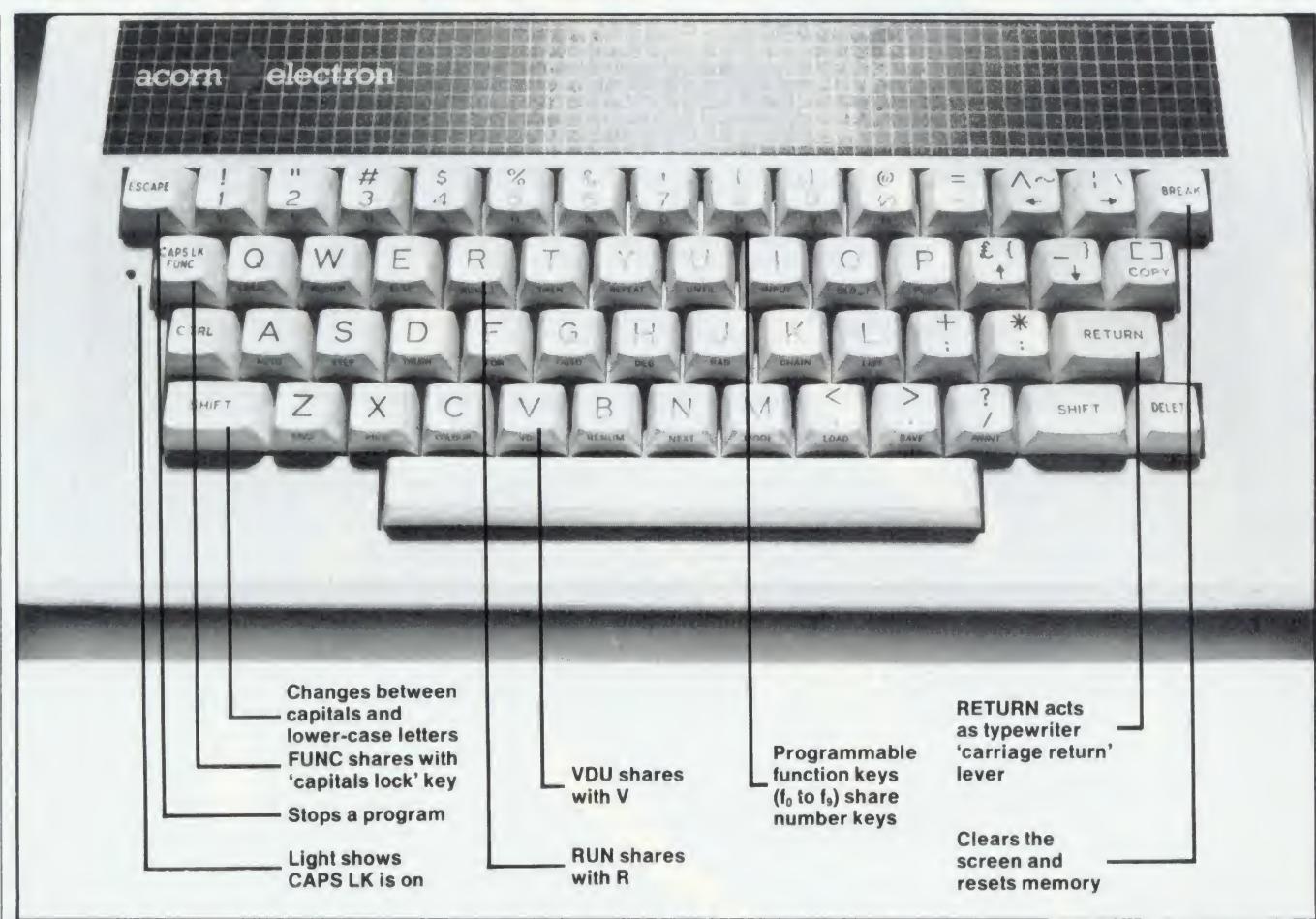
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The Electron keyboard, though smaller, is more complicated than the BBC micro's, because many keys have more than one role

here. By holding down the key marked FUNC (it 'shares' the CAPS LK key) and pressing the key with the command you want, the entire command will be printed onto the screen, giving you single-key, command entry. You can type in a command word normally, it just takes longer. To illustrate the point we can write a very short program to make the Electron beep!

First, press the BREAK key to 'clear' the computer of any rubbish on the screen. Now type in the numbers 1 and 0, in other words the number 10. This is called the line number and is used by the computer to keep the program lines in order, so that line number 10 will come before line 20 which in turn will come before 30 and so forth. The fact that I've just gone in steps of ten has no relevance except that computer programs normally do: it means you can have extra lines without renumbering. Now hold the FUNC key down and press the V key. The letters VDU should have appeared on the screen. Release the FUNC key and now press key number 7; finally, perform a carriage return by pressing the RETURN key. The final result should look like this:

10VDU7

To run the program hold FUNC down

and press the RUN key which shares the R key. The result should be a short beep.

If you look at the number keys you will see that the secondary FUNCtion of these is given as f1, f2 etc. These are the function keys which are somewhat unique to the Electron and BBC micros. They are in effect programmable keys, which means you can insert a command or a series of commands into them. Pressing FUNC and the particular key will cause the items programmed into that key to be printed. For example, the command CLS is used frequently within programs but does not appear as a pre-programmed key. We could program the f1 key to produce PRINT by entering the following line (remembering to press RETURN after):

*KEY1CLS

This has entered the command CLS into function key 1. To prove this, hold the FUNC key down and press the 1 key; the letters CLS should appear on the screen. Other function keys can be programmed in a similar manner using the *KEY command which should be followed by the key number.

To end this month's section of First Byte, we present a program that will

write other programs! Enter listing 1, which programs the function keys to perform certain tasks. Once you have entered it type RUN (remember to hit the RETURN key at the end) to define the function keys. If you wish, save the program to tape at this point. You will see from the listing that the definitions contain a 'l' symbol followed by a capital letter M. This sequence is used to tell the Electron to perform a return after printing the key definition. To obtain the 'l' sign you'll need to type SHIFT and the 'l' key which can be found to the left of the BREAK key.

Now type AUTO (and then RETURN); this command provides an AUTOMATIC line numbering service, first throwing up line 10 and then line numbers in increments of 10 every time the RETURN key is pressed. As each line number is presented press a function key (ie FUNC and the particular numeric key) to enter a line of text. Press the function keys randomly and when you get fed up, hit the key marked ESCAPE. To run your random creation, press FUNC and R together and admire the results. When you want another program hit the ESCAPE key and repeat the sequence. There's no need to re-enter the key definition program as it will stay in the micro's memory.

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HOW TO CORRECT PROGRAM LISTINGS

LISTINGS typed in from magazines often won't work: sometimes the program is wrong, but often typing mistakes are the cause and it can be difficult to know where to start looking for faults. It is a tedious task to find all the mistakes, and, as Schmendrick's law explains, no matter how carefully you check a listing and no matter how many mistakes you find, there is always one more!

Correcting listings is a matter of practice and experience that is slowly and painfully acquired, so this month I present a program that is guaranteed *not* to run (how many other magazines offer such service?). The idea is to spot as many faults in the listing as possible. To make the task a little easier, a corrected copy is included. However, those brave or skilled enough can try to find all the mistakes (there are 50) with-

out looking at the corrected version. Some will only be found when the program is typed in and run, and there is quite a collection of different error messages that will appear. If all else fails, a third version has every mistake indicated.

After all that effort, the program has to do something. This particular one can be used to find out about those mysterious hexadecimal (hex) numbers and how they relate to our normal counting system which uses base 10. It shows graphically and numerically the relationship between base 10 numbers (denary) and base 16 (hex) numbers. It will work equally well on the Electron or on the BBC. The program steps through the first 255 hexadecimal numbers showing how they are converted to base 10. Pressing the escape key at any time allows a denary

40 PROCinitialise. This procedure initialises the screen colours, some of the variables and an array.

50 PROCClocks. Draws the two hexadecimal clocks on the screen.

60 This line takes the user into the second part of the program if the escape key is pressed.

70 PROCrn is the first part of the program where each number is converted from hexadecimal into denary in turn.

80-100 The run loop for the second part of the program. This is an infinite loop, and will repeat until escape or break is pressed.

140 Switch off key auto-repeat.

150 Set print field width to 0. This ensures that when numbers are printed out no gap will be left between them.

160 Dimension B and oldB will be used to store the values of the hexadecimal numbers. The array hex\$ contains the hexadecimal symbol for the appropriate hex number.

170 Switch off the cursor.

180 Change the background colour to blue.

190 Change colour yellow to be black.

200 Define graphics window.

210-230 Routine to store the basic hexadecimal symbols 0-9 and A-F in the array hex\$.

240 Clear screen, defined by the graphics window, and colour it red.

260 Define a text window in the bottom part of the screen.

300 Join text and graphics cursors.

310-330 Print title at top of screen in colour 2.

340-500 First print two sets of hexadecimal numbers in two circles, and then draw the circles. To simplify the program, the graphics origin is moved to the centre of each circle as it is drawn.

550-570 Cycle through the first 255 hexadecimal numbers. PROCdisplay will show the numbers numerically and graphically.

600-710 This procedure takes a number, converts it to two hexadecimal digits, B(0) and B(1). Then it undraws the clock hands and redraws them in the new positions. PROCprint handles the numeric printing in the bottom half of the screen. The program then halts until a key is pressed before ending the procedure.

730-960 This is a long, drawn out routine to print the numeric information on the screen. It could have been shortened had it not been necessary to use several colours for clarity of display.

980-1040 This procedure draws (or undraws) the clock hands for either clock. If Z=5 the procedure will draw a line, if Z=7 it will undraw the line.

1060-1120 This routine forms part of the second half of the program, and repeats until a number in the range 0 to 255 is input. It then calls up the display routine before returning to the main part of the program.

Martin Phillips
offers his advice

number to be entered and the conversion is displayed on the screen. The hexadecimal numbers are shown in black, and the denary numbers in red. Table 1 gives a description of the program and what the various parts do.

```
20 REM Uncorrected version
30 MODE 1
40 PROCinitialise
50 PROCClock
60 ON ERROR GOTO 80
70 PROCrn
80 REPEAT
90 PROCINPUT
100 UNTIL0
110 END
120 :
130 DEFPROCinitialise
```

```
20 REM Correct version
30 MODE 1
40 PROCinitialise
50 PROCClock
60 ON ERROR GOTO 80
70 PROCrn
80 REPEAT
90 PROCinput
100 UNTIL0
110 END
120 :
130 DEFPROCinitialise
```

```
20 REM Uncorrected version
30 MODE 1
40 PROCinitialise
50 PROCClock
60 ON ERROR GOTO 80
70 PROCrn
80 REPEAT
90 PROCINPUT
100 UNTIL0
110 END
120 :
130 DEFPROCinitialise
```

Samples of Martin Phillips' three programs. They can be found in full on pages iii to vi

Table 1. Demonstrates the relationship between denary and hex numbers



Watford Electronics



Dept. BBC, CARDIFF ROAD, WATFORD, HERTS. ENGLAND.

Tel: Watford (0923) 40588/37774 Telex: 8956095 WAELEC
ACCESS ORDERS Tel: (0923) 50234



BBC MICRO

Model B £346



SPECIAL OFFER

For every purchase of BBC Micro during July 1984, we will supply a Data Recorder worth £24 absolutely **FREE**. (At Watford we give you a great deal for your money).

ELECTRON MICRO

£199

Dust Cover for BBC Micro

Protects your expensive Micro from foreign bodies. **£3.50**

SEIKOSHA GP100A PRINTER

10" Tractor Feed, 80 columns, 50CPS. Normal & Double width Char, Dot res graphics. Parallel Interface standard.

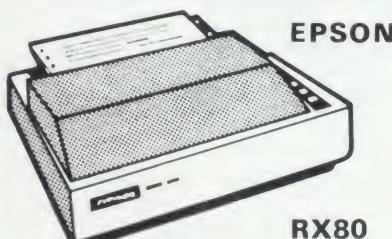
SPECIAL OFFER Only: **£144 £7 carr.**

FRiction FEED

Attachment for GP100A or 250X Printers **£28**

GP-700 Colour Printer Screen-dump routine in ROM FOR BBC Micro

£12



EPSON

RX80

100 CPS, 9 x 9 matrix, dot addressable graphics, condensed and double width printing. Normal, Italic and Elite Graphics. Tractor feed, 10" max width, bi-directional, logic seeking. Centronics Interface standard.

ONLY £229 (£7 carr.)

EPSON RX80 F/T PRINTER

As above but has both Friction and Tractor Feed. **£245.00 (£7 carr. Securicor)**

PRINTER INTERFACE BUFFER

Neatly packaged self contained box, supplied complete with all leads, manual and detachable power supply.

Price: 16K Unit **£115**
Price: 48K Unit **£149**

Epson FX80 Printer

160 CPS, 11 x 9 matrix, proportional spacing, superscripts, subscripts, dot addressable graphics. Normal, Italic and Elite characters. Up to 256 user definable characters. Down loadable character set. Condensed and double width printing. Full proportional spacing. Four user defined margin positions. Tractor and Friction feed. 10" maximum width Bi-directional, logic seeking Centronics interface standard.

ONLY £319 (£7 carr.)

Epson FX100 Printer

Same as FX80 but has a 15" wide Carriage **£495**

Type	Ribbons	Dust Covers
MX80FT	£4.75	£4.50
MX100/FX100	£10.00	£5.25
FX80	£4.75	£4.95
RX80	£4.75	£4.50
GP80	£4.50	—
GP100	£4.95	£3.95
GP250	£5.95	£3.95
GP700	£18.50	—
KAGA KP810	£5.95	—

RX & FX PRINTER INTERFACES

RS232	£35	RS232 + 2K Buffer	£59
IEEE 488	£65	2K Parallel	£58

BROTHER HR-15 DAISY-WHEEL PRINTER

An exceptionally high quality daisy wheel printer at the price of a dot matrix printer. 18CPS; bi-directional, 3K of buffer; has clear buffer facility, carriage skip movement, proportional spacing; underlining; bold print and shadow print. Prints in two colours; super and subscript facility. Impact control facility to vary pressure on paper for making carbon copies. Has Centronics parallel or RS-232 interface. Connects directly to BBC Micro. A ribbon cassette plus a separate red ribbon. Optional extras: single sheet feeder takes up to 150 A4 sheets; a keyboard that transforms HR15 into a sophisticated electronics typewriter. Attractively finished in beige.

ONLY £349

Single Sheet Feeder **£199**

Keyboard **£150**

RIBBONS: Carbon **£3**; Fabric **£3**; Multistrike **£6**

LISTING PAPER (Plain)

1,000 Sheets 9½" Fanfold Paper	£7
2,000 Sheets 9½" Fanfold Paper	£13
1,000 Sheets 15" Fanfold Paper	£9
Teleprinter Roll (Econo paper)	£4

PRINTER LABELS

(continuous stationery)

1,000 90 x 36mm	£5.50
1,000 90 x 49mm	£7.75
1,000 102 x 36mm	£6.25

Carriage on Printer Paper or Labels £1.50

BBC Micro WORD-PROCESSING PACKAGE

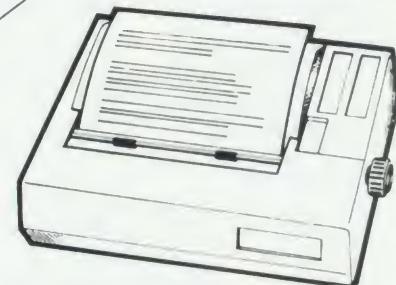
A complete word processing package consisting of: BBC Model B, Zenith 12" Green or Amber Monitor, Twin 200K highly reliable (1 year warranty) Teac Disc Drives in matching beige colour, the popular WORDWISE word processor, Watford's own highly sophisticated 62 File DFS interface fitted, world renowned Brother HR 15 Daisy Wheel Printer, Gemini's BEEBCALC Spreadsheet Analysis, MAILING LIST and DATABASE Softwares on Disc, 10 blank 3M Discs (Lifetime warranty), A 4 way mains distribution socket, 10 blank diskettes, 500 sheets of fan-fold paper, Manuals and all the leads. To enable you to carry your Micro around, we shall pack it in our Antique Brown leatherette Attache carrying case

ONLY £1,249 (carr. £15)

(P.S. We will alter the package to suit your requirement. Call in for a demonstration).

NEW

KAGA KP810



This new JAPANESE printer has EPSON FX/RX compatible commands. 140 CPS Dot matrix Printer, offers NEAR LETTER QUALITY print in a 23 x 18 dot matrix in addition to the standard Epson style type-faces on the 11x 9 matrix. Friction feed, Adjustable tractor feed. Single sheet feed and built-in Paper Roll Holder. Normal, Italic, Enlarged, Condensed, Super and Subscript. Dot addressable graphics (8, 9 and 16 pin modes). Proportional spacing. (Optional extra: Down loadable character set in 8K RAM or RAM). NEAR LETTER QUALITY print, selectable at switch on. 10" maximum width, bi-directional, logic seeking. 3K Buffer. Half speed quiet mode. Convenient Paper-out sensor switch. Centronics Interface standard. All this plus our no quibble 12 months warranty.

Special Introductory Offer: ONLY £269
RS232 Interface + 2K Buffer **£89**

KAGA KP910 PRINTER

Similar features as the above KP810 printer but has extra wide carriage. Will accept upto 17" maximum width paper. 156 column normal and 265 column condensed.

ONLY: £349

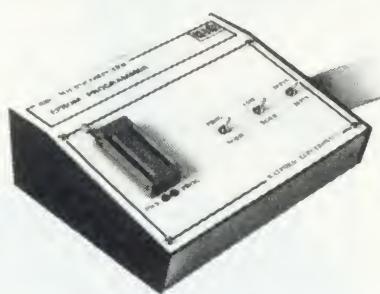
PRINTER LEAD 36"

Ready made printer lead to interface BBC Micro to EPSON, SEIKOSHA, NEC, STAR, JUKI, BROTHER, SHINWA, etc., Printers.

ONLY £7
£10

Special Extra long 5 feet Cable

EPROM PROGRAMMER



At last! – the EPROM Programmer for BBC Micro Computer from WATFORD ELECTRONICS

that will suit both your pocket and all your requirements. Programs all popular types of EPROMS from 2K bytes up to 16K bytes – **2716 — 2516 — 2532 — 2564 — 2784 — 27128**. Our Programmer has been designed to make sure the EPROMs are neither programmed too fast nor too slow; just at the right speed as recommended by the manufacturers of the EPROMs (any deviation in timings can burn their brains out).

This extremely powerful system is designed for your needs of TODAY & TOMORROW! – BBC Basic programs can be copied into EPROM and subsequently re-loaded faster than from a disc! Suitable for both hobbyist and professional users!

Just look at these features:

- **COMPLETELY SELF CONTAINED** – Housed in its own sturdy case – Uses its own power supply – connects directly to the 1MHz Bus – Simple and Safe!

- **FULL SOFTWARE SUPPORT** – Comes complete with simple to use fully machine code ROM based software and easy to understand manual. Facilities include Varification, Reading, Virgin Testing, Writing, Editing, Saving, Loading and more! NOTE!! – This software does not simply comprise hastily prepared routines to get you going, but is a professional, purpose designed applications package.

- **ACORN BUS COMPATIBLE** – Use of the 1MHz connection complies with all Acorn addressing recommendations – That means you can still add-on such things as the TELETEXT, IEEE 488 TUBE and PRETEL

- Allows more than one program to reside in an EPROM using the ROM Filing System.

ONLY £89 incl. Manual (£3 carr.)

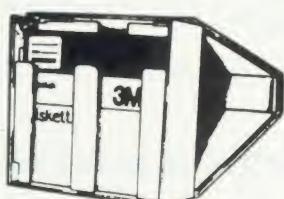
TEX EPROM ERASERS

EPROMs need careful treatment to survive their expected lifetime. Rushing it could burn their brains out. So cop-out of this helter-skelter world; take it easy the TEX way and give your chips a well earned break. Cool, gentle and affordable. EPROMPT does it properly.

Two versions available:

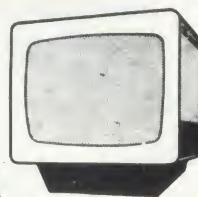
- **EPROMPT EB** – The standard version. Erases up to 16 chips. £28.00
- **EPROMPT GT** – Erases up to 28 chips. Has an incorporated safety switch which automatically switches off the UV lamp when the Eraser is opened. £30.00
Spare 'UV' Lamp bulbs. £9

PLASTIC LIBRARY CASES



for Disc Storage 5½" (holds 10) £2

MONITORS



● MICROVITEC 1431

14" Colour Monitor, RGB Input. (as used in BBC programmes) FREE Interface Lead. **Special Offer £174**

● MICROVITEC 1451 Hi-res

14" Monitor incl. lead £295

● MICROVITEC 1441 Super Hi-res

14" Colour Monitor £389

● KAGA RGB 12" Medium Resolution Colour

£195

● KAGA RGB 12" High Resolution Colour

£259

● KAGA 12" Standard resolution colour

MONITOR/COMPOSITE VIDEO **ONLY £195**

● BNC Connecting Lead

£3

● RGB Connecting Lead

£5

● ZENITH 12" High resolution, jitter free picture, Amber or Green

£75

Carriage on Monitors £7 (Securicor)

5½" DISKETTES

(Lifetime warranty)

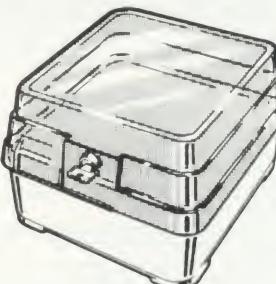
Why settle for less, Buy the best.

- 10 Verbatim or 3M Diskettes S/S D/D £17
- 10 Verbatim or 3M Diskettes D/S D/D £28

DISC ALBUMS

Attractively finished in beige leatherlook vinyl. Stores, protects and displays 20 discs in double-sided clear view pockets. **ONLY £4.95**

LOCKABLE STORAGE UNITS



Attractively finished, strong beige plastic base fitted with dividers. Smoke acrylic top. Supplied with adhesive title strips for ease of filing.

● M-35 Holds upto 35 mini discs £14

● M-85 Holds upto 85 mini discs £18

FLOPPY HEAD CLEANER KIT

Unless your Office/Home is dust free, you should clean floppy-heads at least once a week to avoid the risk of cross contamination. Very simple to use. Only £14

MONITOR CRT SCREEN CLEANING KIT

The anti-static spray controls dangerous static charges on the screen surface and ensures its optical clarity. £12

KEYBOARD CLEANING KIT

£16

PRINTED CIRCUIT BOARD CLEANING & LUBRICATION KIT

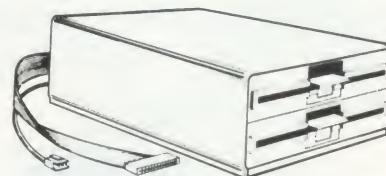
£14

DISC DRIVES CASED WITH

CABLES (less PSU)

(All Drives are NEW SLIM-LINE Type)

NEW LOW PRICES



● CLS 100 Single, TEC Single sided 40 track 100K, 5½" Disc Drive £119

● CLS400 Single, Mitsubishi Double sided 80 track 400K, 5½" Disc Drive £179

● CLS400S Single, Mitsubishi Double sided 40/80 track Switchable, 400K, 5½" Disc Drive £215

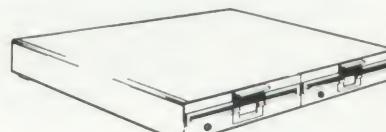
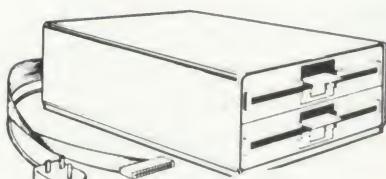
● CLD200 TEC Single sided 40 track 200K, twin 5½" Drives £245

● CLD800 Mitsubishi Double sided 80 track 800K, 5½" TWIN Drives £359

● CLD800S Mitsubishi Double sided 40/80 track switchable, 800K, Drives £399

(CUMANA) DRIVES CASED

WITH PSU & CABLES



● CS100 TEC Single sided 40 track 100K 5½" Single Disc Drive £139

● CS200 TEC Single sided 80 track 200K 5½" Single Disc Drive £205

● CS400 Mitsubishi Double sided 80 track 400K 5½" Single Drive £225

● CS400S Mitsubishi Double sided 40/80 track 400K 5½" Single Drive £340

● CD200 TEC Single sided 40 track 200K 5½" TWIN Disc Drives £245

● CD400 TEC Single sided 40 track 200K 5½" TWIN Disc Drives £365

● CD800 Mitsubishi Double sided 80 track 800K 5½" TWIN Drives £425

● CD800S Mitsubishi Double sided 40/80 track Switchable 800K TWIN Drives £465

● SPARE DRIVE CABLES, SINGLE £6; DUAL £8

● DFS Manual (comprehensive) £7.50 (No VAT)

P.S.

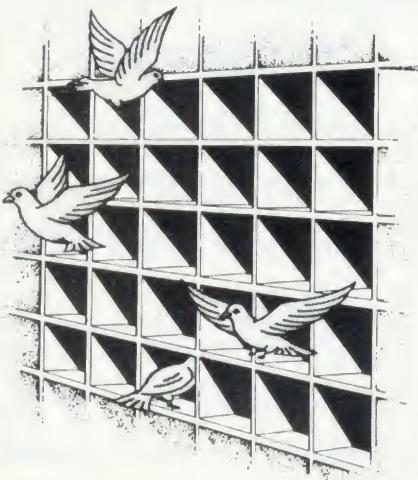
1. You do not require Formatting Discs when using our DFS as the formatting program is in the ROM, nor do you require expensive 40/80 track switchable drives as with our DFS you can read and write both 40 and 80 track discs in an 80 track drive (software switchable).

2. Our **MITSUBISHI** Slimline Disc Drives are Double Sided, Double Density, 1 Megabyte. Track density 96 TPI, track to track access time 3mSec. They are fast, efficient and highly reliable.

Continued →

WONDERFUL WATFORD

TWO DATABASE SOFTWARE for BBC MICRO



DISCDATA

At last for BBC Micro Disc users, Watford Electronics have produced 'DISCDATA' which must be the most versatile general database at the price on the market. The length of your files is restricted only by the space on your disc. You can have upto 20 fields with 'page' length records of upto 254 characters. The program is completely menu driven obviating reference to a manual although written guidance is given with the program. Add and delete records, amend title, field names and records, sort on any field and search for any record or group of records in any field. You do not need to abandon or rewrite your files if you wish to add additional fields or extend the length of any field, the program will rewrite the files for you. Your files can be in any drive. Output can be in 40, 80 or 132 character width with Printer routines. Two forms of output are provided for horizontal for label type output and a tabulated output with title and headings. What is more, the selected fields can be placed in any order on the screen. In the horizontal mode you can scan backwards or forwards with wrap around effect. Output can be started or stopped anywhere in the file. There is automatic totalling on decimal fields and an automatic count of the number of records output. Now with extra 3 features: Allows string search; Calculations can be done on numeric fields; Create Sub-Files from the main File.

On disc at

Only £15

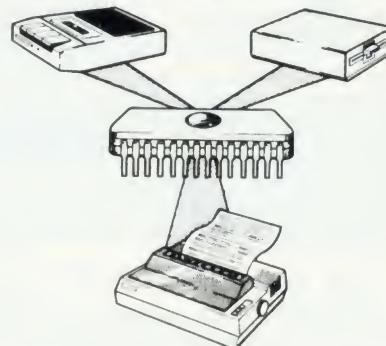
It has to be the best value.

FILE-PLUS

Now even more powerful with the added facility of a SHELL SORT on any field. This must make DATA-PLUS the most powerful and versatile Database to be found on BBC Micro. A 16K ROM containing the most flexible and easy to use disk based Database system on the market. A database may occupy your total on-line storage capacity. You may design any number of data entry forms using a "paint" on screen technique. Forms may be upto 3 screens in size. A form may be used to Add, I, Delete, Update, Print and Spool records from your Database. Quick search facility on any text field. A query language provides full maths support (-, +, /, *, +999999999.9999) and compare facilities (=, >, <, <=, >=, &, ||) when used with the keywords - Assign, Compare, Display, End, Goto, If, Ift, Print, Read, Search, Spool and Update. Full printed output control via embedded commands. Supplied with 70 page manual and fitting instructions.

Only £43

BUFFER & BACKUP ROM



A very versatile firmware. An ideal ROM for engineers, programmers, teachers, students, etc.

- ★ Converts your Sideways RAM to a 4K or 16K BUFFER for a parallel printer. (Uses *FX5,3). (You no longer require to purchase expensive (£100+) Printer Buffers.)
- ★ Dumps selection of Disc files to Tape.
- ★ Makes backup copies of tapes onto Tape, Disc and Hobbit.
- ★ Displays contents of a chosen paged ROM on screen.
- ★ Menu display on 'shift-break' using ROM Filing System.
- ★ Comprehensive Manual

Simply a give away at

£18

GEMINI'S BUSINESS SOFTWARE

Cashbook Accounts	£52
Final Accounts	£52
Invoices & Statements	£17.25
Commercial Accounts	£17.25
Mailing List	£17.25
Database	£17.25
Stock Control	£17.25
Home Accounts	£17.25
Beebcalc Spreadsheet Analysis	£17.25
Beebplot	£17.25
Payroll	£39

N.B. All the above Gemini software is on tape. For Disc Based (40/80 track) please add £3.

VERSATILE LIGHT PEN SOFTWARE

- Enjoy, Explore, Educate!
- Pixel, Line, Character Definition
- Free hand drawing
- All Colours - MANY Special Effects
- Fill, Repeat and Stripes
- User defined "Brushed Strokes" plus Character definer
- Grid, Scale, Perspective aids
- 2 TO 200 Points palatable in one Design with Circles and "RUBBER BANDING"
- Move design/character to any screen position
- Save and Load screens, User defined Graphics and line drawings for video titles. Own programmes, etc.
- Many Educational uses
- Instruction booklet included
- Full software support for "CUSTOM USE"
- Works with Watford, RH, Acorn User, DIY, and many other LIGHT PENS
- Available on DISC or TAPE

Price: Tape £10; Disc £11

DISC EXECUTOR

Disc Executor is a highly sophisticated disc utility which allows you to transfer all tape based software that we know of onto disc. You no longer have to throw away any of your cassette based software on acquiring a disc drive. It handles 'locked' programs and allows you to load full length adventure type programs (i.e. up to & 6E blocks) and programs that load below & E00. It is very simple to operate (full instructions supplied). It saves you your valuable time and money too. Our Disc executor is not a Replica its the 'Real Thing'. Available in both 40 and 80 track discs. Please specify when ordering.

Price: £10

ROM MANAGER



This unique piece of firmware has been designed to allow the USER to access the BBC Micro's Sideways Rom Paging facility to the full. The 18 Commands our ROM MANAGER adds to your computer are concerned with 3 aspects of ROM use:

1. **ROM CONTROL** - Ability to activate at random any of the ROMs present in the Micro.
2. **BBC MICRO's STATUS** - e.g. Checksum on any ROM, and the Filing system currently active.
3. **ROM DEVELOPMENT** - Allows main memory to be used like Sideways RAM.

The Commands available are:

- **CHECKSUM** - generates a CRC for the specified ROM.
- **DIRECT** - allows you to pass a particular command to the specified ROM.
- **EXAMINE** - allows examination of the named ROM.
- **EXPLAIN** - gives detailed description of the first 22 FX codes.
- **FILE** - passes the command directly to the currently selected filing system.
- **FUNCTION** - displays the string currently programmed onto the function keys.
- **INCLUDE** - allows he main memory to be used for developing ROM software without need to purchase expensive sideways RAM.
- **MODIFY** - any location in memory is displayed and can be modified with this command.
- **NAMES** - displays the names of any resident ROMs.
- **RAM** - allows the command to be passed directly to the RAM based ROM'
- **REMOVE** - turns off the 'RAM based ROM' option.
- **SPECIFY** and **DEFAULT** - specifies the default ROM and passes the named command to the default ROM specified
- **STOP** and **START** - allows the named ROM to be disabled or enabled, preventing clashes between ROMs.
- **STATUS** - provides information about the ROMs inside the BBC micro, including the socket number, the name of the ROM, its length, whether or not it is enabled and supports language or service entry points.
- **VALUES** - outputs information concerning the status of ROM MANAGER e.g. the socket number it occupies, the number of active ROMs with a higher priority than itself, the current filing system.
- **VECTOR** - the same function as *DIRECT, but provided in case *DIRECT clashes with other ROMs.

In our opinion this ROM is one of the most useful utility ROMs available on the market, and is a must for anyone using ROM based software.

Introductory Price: Only £19

ADE

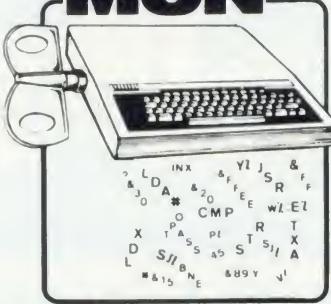
The complete program development package on 16K ROM. A must for all the Assembly Language Programmers.

Introductory price: Only: £52

ACCESS HOT LINE

Tel: 0923 50234

BEEB MON



Watford's own Machine code Monitor ROM written by Andrew Bray (Cambridge), co-author of the BBC Micro Advance User Guide.

The most powerful and versatile machine code monitor ROM yet written for BBC Micro. It has all the normal memory editing, moving and relocating facilities, plus all editing is with a full screen editor allowing scrolling up and down memory, entering in Hex, ASCII or standard assembler mnemonics.

In use as a debugging tool, you run code under a total emulation system. Ever felt a desperate urge to set a break point in ROM? No problem - you can even have breakpoint on reading or writing locations in memory and on register contents. The system fully supports debugging of sideways ROMs e.g. BASIC can fully and easily be run from within Beebmon and from there DFS and other sideways ROMs can be used in total emulation mode.

Beebmon can even run itself. In so doing you can nest Beebmon up to a level limited only by the memory size. Beebmon uses 256 bytes of workspace, located anywhere in memory, even on the 1MHz Bus. Beebmon effectively uses no zero page workspace, so your program (e.g. BASIC) can use any or all of the base page. How does it achieve this? By providing a 6502 interpreter all programs running under it exist in a virtual BBC, so special memory locations like the ROM latch are not actually accessed by your programs, instead they alter a location in Beebmon's workspace. Emulation also allows immediate return to Beebmon command level by ctrl-escape no matter what code is being executed at the time. All this exceptional power and flexibility is complemented by a clear and detailed manual included in a value for money price of:

£22

Disassembler Rom



Discover the hidden secrets of BASIC and the OPERATING SYSTEM with this easy to use programmers tool.

A ROM based machine code Disassembler for the BBC micro. It enables machine code programs to be listed in BASIC/DUMP format and thus is the perfect complement to the built in assembler. It allows Sideways ROMs, files on disk or tape to be listed, and also has a comprehensive editor, allowing mnemonics to be altered directly, as well as HEX, DECIMAL, ASCII and BINARY memory editing. There is also a full set of labelling facilities available (up to 3,200 labels), with the major locations and routines already labelled.

Thus DIS-ASM enables any monitor program, such as BEEBMON to be used to much greater effect as it is not necessary to disassemble memory each time the display is altered.

ONLY £16

(Price includes a comprehensive manual and fitting instructions.)

COMPUTER CONCEPT'S ROMS

Graphics ROM **£28**

Basic Utility ROM **£28**

DISC DOCTOR

A sophisticated Disc Utility ROM with many useful commands. (For detail description please refer to Computer Concept's advert in this magazine.)

£27

Wordwise

Without doubt a very sophisticated piece of software for the BBC Micro. It has all the features of a professional word processor yet is easy to use.

SPECIAL OFFER THIS MONTH: **£32**

THE INVESTIGATOR

Now you can make up back-up copies of all your Discs. Put the precious originals away in the safe and use your duplicates.

See what your 8271 can do! With Watford's Investigator you can find out about track formatting, sector length, etc. Investigate your disc and then make up your back-up copy. Disc based software includes a comprehensive manual.

Price: **£15**

(Please specify 40 or 80 track when ordering)

CRAWLER

A new challenge for your reflexes, exercise for your fingers. Crawler is the best yet BBC version of the popular arcade game "CENTIPEDE". Blast the voracious caterpillar before it eats you. Avoid the wandering spiders. Shoot the scorpions before they poison the mushrooms. Kill the descending fleas as they cause massive mushroom growth. This game is a delight to play. The controls are responsive and fast yet precise.

Only **£5**

LIGHT PEN

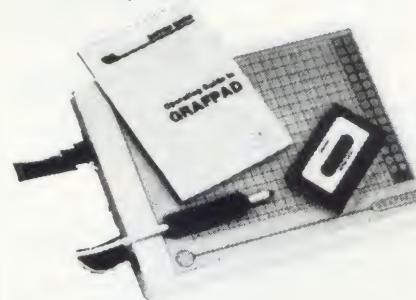
A Light Pen for BBC Micro including our highly sophisticated Pen-Pal software on tape.

Only: **£18**

(Please add £2 for software on disc)

**WATFORD - Always
a step ahead**

GRAPH PAD



With this popular British Micro's Graph-pad, you can add new dimension to your computer enjoyment. It helps you to create your own application programs by the simple use of the Graphpad. Ideal for Educational use. Supplied complete with Cables, Manual and a two program cassette.

Price: **£125**

GAMES SOFTWARE

CHESS	£6.95
CROACKER	£6.95
Escape from MOONBASE ALPHA	£6.95
CHUCKIE EGG	£7.90
FELIX in the FACTORY	£6.95
GALACTIC COMMANDER	£6.95
KILLER GORILLA	£6.95
MUNCHYMAN	£5.95
MOONRAIDER	£6.95
MUSIC SYNTHESISER	£8.25
PENGU (Watford)	£7.75
SWOOP	£6.95
Twin Kingdom Valley	£8.25
747 FLIGHT SIMULATOR	£7.75

LEVEL 9 ADVENTURE GAMES

COLOSSAL ADVENTURE. The classical mainframe game "Adventure" with all the original puzzles plus 70 extra rooms.

£8.65

ADVENTURE QUEST. Through forest, mountains, desert, caves, water, fire, moorland and swamp on an epic quest vs tyranny.

£8.50

DUNGEON ADVENTURE. Over 100 puzzles in the Demon Lord's dungeons.

£8.50

SNOWBALL. Save a 7000 location colony starship in 2302 AD.

£8.50

SURGE PROTECTOR Plug

Safely eliminates dangerous voltage surges. During a thunderstorm, a nearby lightning strike can induce high voltage spikes in the voltage supply or fluctuating loads can also result in transient overvoltages which if unchecked, lead to expensive data corruption/loss. Our surge protection plug will provide the necessary surge protection. Simply replace your standard 13Amp mains plug with the surge protection plug (which is almost the same size). Ideal for computers, Hi-Fi systems, precision instruments, fridge freezers, etc. Max. surge current 2Kamp; Max. Voltage 250 Volts. A must for all serious computer users.

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**WATFORD
ELECTRONICS**

Continued →

MK 2 13 ROM SOCKET EXPANSION BOARD

Now all lines fully buffered – On board battery back-up facility – will now accept EPROMS 2716, 2732, 2764 & 27128 and ROMs 6116 & 6264.

Simply plugs into one of the four ROM sockets currently available in BBC Micro. There are only 5 solder connections to be made. Full instructions are supplied. This board has been ergonomically designed to enable the user, easy further expansion inside the Micro, e.g. Double Density Board, Torch Board, etc. (At Watford, we think ahead.)

Our Mk2 13 ROM Socket Board enables the User to increase the sideways ROM capacity from the basic 4 sockets upto full 16 capable of being supported by current operating systems. In addition the board is designed with the facility to hold upto 16K RAM, which when switched into operation is automatically selected by any WRITE signal to the Sideways ROM area. This gives the User the ability to write a utility or language and upon pressing break have the utility or language up and running (new ROM software can be developed and tested in situ.)

The Board gives the User, plenty of freedom to explore the possibilities of the new paged ROMs due in the coming months and offers them the chance to develop their own.

All lines are fully buffered and the Board meets or exceeds all timings for operation in the BBC Microcomputer. When fully populated, the ROM Board consumes less than half the recommended maximum current limit.

Supplied ready-built and tested complete with fitting instructions.

ONLY £32.50 (carr. £1)

Versatile BEEB SPEECH SYNTHESISER Unit



SIMPLY the best! – An unlimited speech synthesis system. Complete with easy-to-follow manual. Controlling software is in ROM so no Cassette Loading problems!

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BUILT-in Library of approximately 500 words to get you started.

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HOURS of fun! – Suitable for any application – Games, Educational Programs, Specialised Packages.

We know this all seems to good to be true but DON'T BE LEFT SPEECHLESS! Order your Versatile Speech Unit now!

Only £44

THE ULTIMATE DFS FOR BBC MICRO

by



Highly acclaimed at The ACORN and BBC MICRO USER Shows. What do the independent press say?

Good value for money – *Beebug Aug. '83*
A very worthwhile package – *The Micro User*
You'll be buying a very powerful package –
Personal Computer News
Superior DFS; Excellent disc sector editor –
Computer Answers

Without a doubt, the most sophisticated DFS Software yet written for BBC Micro Computer. This powerful new DFS is fully compatible with ACORN DFS yet has much increased power due to additions, carefully designed to make life easier in normal use. It consists of over 14K of efficiently written machine code. It is entirely self contained and so does not require a utilities disc to function.

PRICES:

DFS (Disc Filing System) ROM £29

Complete Disc Interface Kit including DFS ROM & Fitting instructions £99

Disc Filing System Manual. Comprehensive and clearly written £7.50 (no VAT)

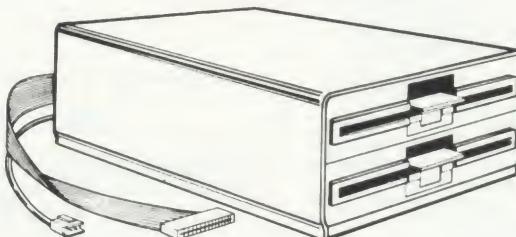
P.S. We will exchange your existing ACORN DFS or PACE (AMCOM) DFS for Watford's highly sophisticated 16K DFS ROM for £25

Watford's DFS is exclusively available from Watford Electronics. We do NOT retail through any dealers. Every ROM carries a label with our LOGO and a serial number.

EPROMs & CMOS RAMs

2764-250nS (8K ROM)	£5.95
27128-250nS (16K ROM)	£24.00
6116-150nS (2K RAM)	£6.00
6264-150nS (8K RAM)	£32.00

SPECIAL DISC DRIVE OFFER NEW SLIMLINE, 5½", CASED WITH CABLES



CLS100 TEC, Single 100K, 40 track, Single Sided £115

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(Carriage £5 securicor, insured)

BEEBFONT ROM

BEEBFONT is a remarkable new concept in BBC software, exclusively available from Watford. Once fitted, the 16K ROM will enable you to produce attractive text displays in following different styles:

A B C D E F G H I J K L M N O P
a b c d e f g h i j k l m n o p

A B C D E F G H I J K L M N O P
A B C D E f g h i j k l m n o p

A B C D E f g h i j k l m n o p
A B C D E j g h i j k l m n o p

A B C D E F G H I J K L M N O P
a b c d e f g h i j k l m n o p

A B C D E F G H I J K L M N O P
A B C D E F G H I J K L M N O P

A B C D E F G H I J K L M N O P
a b c d e f g h i j k l m n o p

A B C D E F G H I J K L M N O P
A B C D E F G H I J K L M N O P

A B C D E F G H I J K L M N O P
A B C D E F G H I J K L M N O P

★ It works in modes 0, 1, 2, 4, using full colour.

★ Simply use Ctrl-V to select the font and all further screen output will be in a new style.

★ Even the ordinary Beeb character set can be enhanced by doubling height or width and emphasising to give bold print.

★ A comprehensive editor is included which enables the user to design his own characters.

★ A spooling program is provided, which enables pre-formatted text files to be displayed on an EPSON FX, RX, and NEC Printers, using the full range of character styles. (Please specify printer type when ordering). Can be used with WORDWISE

★ This really must be one of the most original and exciting products of the year.

★ A twenty page manual is provided and the demo/editor software comes on disc or cassette (please specify when ordering).

ONLY £39

WATFORD'S BEEB PRINTER ROM



"Makes Printing Childs Play"

You are fed up with not being able to unravel your printer manual and use all those features you paid for? Need sensible paging for use in the creation of booklets? Then you certainly need our Beeb Printer ROM.

A machine code printer utility in ROM.

- 'Single' key operations replace control code sequences for underline, font and size selection, paper movement, etc. Up to 30 come pre-defined, without effecting normal fn key usage.

• This rom allows easy control of your printer from 'Within' WORDWISE text. Instead of long escape sequences, you just 'OC' a single number to Select, Underline, Print Styles, etc.

• Automatic fanfold page margins. Puts gaps in listings. PRINTed text etc to skip the folds. The gap size alternates to minimise paper wastage when using binders.

• Form feed and related commands, made available on ALL printers. Can also provide a left margin.

• User defined characters embedded within text are printed as on VDU.

• Commands select option for GP100, STAR, NEC, MX/FX, LP VII/DMP100, DMP200. Operates with Parallel and Serial Printers.

• Fully functional with the popular WORDWISE wordprocessor.

Supplied complete with a comprehensive 50 page manual.

Price: £24

(When ordering, please specify printer type)

DUMPOUT 3

A highly sophisticated machine code ROM providing screen to printer dumps in any mode, plus window setting utilities and two new OSWORD calls that allow you to use the Beeb graphic coordinate system for plotting or testing mode 7 pixels.

*GIMAGE Ultra sophisticated dump of any graphic screen using up to 8 tones. Handles **FULL MODE 7 text**, graphics, double-height and colour and mode 8, 14 optional parameters using prefixing so that you only need specify the ones that you want. The parameters include

• **V scale**, **H scale** These are both 2 byte numbers giving you very fine control over the dump size from minute to enormous. Unlike other dump Roms scale does not vary with screen mode

• **R < 0-3** Dump rotation 0, 90, 180, 270 degrees.

• **I indent** Set gap from left edge of paper

• **X min < max**, **Y min < max** The area of the screen dumped is that in the graphics window alternatively these parameters may be given

• **P** Physical colour values used for dumping. (Otherwise use a negative scale, i.e. white prints darkest)

• **T** Two tone dumps for higher resolution

• **M mask** 8 bits controlling colour masking

• **E** Contrast expansion Makes mode 7 text characters and separated graphics stand out more clearly from the background

• **C** All mode 7 graphics printed as reduced size dumps

• ***GWINDOW** Draws graphic window on screen, its size and position can then be altered using the cursor keys

• ***IMAGE** **I indent** Does a fast text only dump of the text window in any mode.

• ***WINDOW** As GWINDOW but for text.

DUMP OUT 3 gives you ALL of the GIMAGE facilities listed above and GWINDOW in mode 7 as well, not just hi-res modes

Ideal for CP80, GP80, DP100, GP250, STAR, KAGA/TAXAN, NEC SHINWA CP80, GEMINI EPSON MX/RX/FX LPVII DMP100/120/200/400 Printers

Comprehensive Manual included Only: £19

WATFORD JOINS THE COMMUNICATION REVOLUTION

MODEM 84



With the launch of Watford's MODEM 84 you can now hook into PRESTEL, MICRONET, HOMELINK, TELECOM GOLD, etc, for about the cost of a good tape recorder. Prestel gives you access to an incomparable database covering almost every subject under the Sun. There is Micronet with lots of free programs that you can download and run. Details of Clubs and User groups, a diary of meetings and exhibitions, news and reviews, technical information, etc. There is Homelink with On-line banking. And there is armchair shopping, travel information, Entertainment, World News, Sports News, Business News, Weather information, Electronic mail and lots more. The basic Prestel subscription is only £5 per quarter for domestic user and at off-peak times there is no charge for access time. Can you afford not to be part of this revolution?

Now using the latest techniques and the new generation of Modem chips, Watford have developed a Modem that is newer, better and yet cheaper than any on the market.

Compare the Specifications:

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- Direct-connect Modem using BT approved isolation components.
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- User to-User half duplex 1200/1200 Baud operation with AUTOMATIC SEND/RECEIVE switch (BEWARE - most MODEMS switch manually between send and receive which precludes the use of intelligent user-to-user software).
- Simple single button operation and comprehensive LED status display.
- Attractively finished. Sized to sit on the Disc drive

NEW FX80 PRINTER DRIVER for VIEW

Do you want to use Italics or Enlarged Characters with View? French or German Characters? These and other FONTS from FX80 character sets can be accessed using our Printer Driver with VIEW. The disc contains an example as well shows how to use. Available on 40 or 80 track Disc.

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EPSON DUMP ROM

A specially designed Dump ROM for EPSON RX, FX and the new Kaga KP810 Printers. Will accurately DUMP all Screen modes including TELETEXT, GRAPHICS and DOUBLE HEIGHT. MULTITONE DUMPS are also supported. Simple single command (*SCDUMP) operation.

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NEW SUPER PRESTEL INTERFACE ROM

Fully compatible with Watford's MODEM 84 as well as with PRISM and most other Modems.

- Supports full Prestel Colour Alpha and Graphic Characters including Double Height, Flashing, Conceal/Reveal.
- Called by simple *PRESTEL command. Disc and Tape configurations fully supported.
- Telesoftware downloader included.
- Comprehensive MAILBOX facilities including offline editor.
- Auto Logon sequence, can be burnt into ROM if desired.
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- Page load and save to tape or disc. Pages are automatically saved under Page Number reference in a 'FRAME' directory.
- Print page options are ASCII only (i.e. with suppression of Graphics) - fast and works with any printer - as well as a full graphics dump for the popular Epson printer.
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- All the above facilities available from Function Keys. An overlay is provided giving simple yet comprehensive guidance to the key functions.
- Comprehensive instruction manual supplied.

PRICES:

SOFTWARE ROM incl. Comprehensive Manual	£20
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(Please allow upto 28 days for delivery)

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VIEW

Wordprocessor (New version)

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This superb (FIG FORTH) compiling language now available in ROM. Simply plugs into one of the ROM Sockets. Manual included.

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FOR BBC

We are proud to announce the launch of our Double Density Board for the BBC Micro. The DDS software that we supply is a version of our highly acclaimed standard 16K DFS for the BBC Micro. It will automatically tell whether a single or double density disc is being accessed, as well as allowing the option of reading 40 track disc on an 80 track drive. Now on your 80 track Double Sided Drive you will have 720K storage instead of the usual 400K and with higher speed than ever before (of course this is a BONUS at NO EXTRA COST). Complete Double Density Upgrade Unit will cost same as single density Kit.

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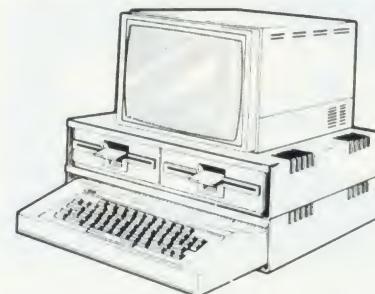
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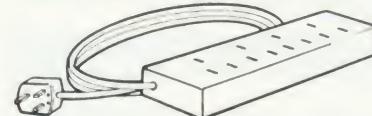
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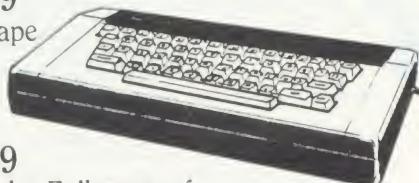
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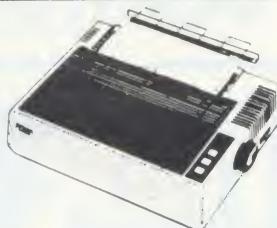


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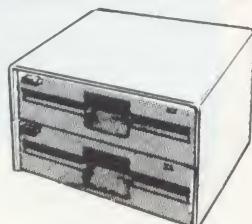
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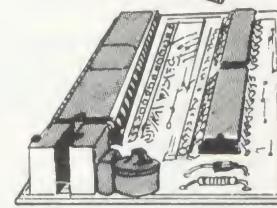
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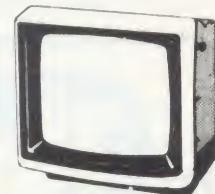


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Voltmace delta 14b

Robot

Plotter

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SOUNDS INVITING

THIS month's musical interlude is provided by Welsh wizzards Gary Pesticcio and Darran Bristow. *The Brook*, *Riding* and *On the Lake* were written for the BBC micro (model A or B), but both will run on the Electron, though they will not sound as good because of the limited sound capability on the Elk.

For readers who aren't familiar with music, we've annotated the listing, and two more tunes are given on yellow listing page i. Just type them in and RUN.

Lines 10 to 90

Program details. Title, date, authors and micro notes.

Lines 100 to 110

Select screen mode and choose blue background with white letters.

Lines 120 to 140

Print five carriage returns and print title and copyright message on the screen.

Lines 150 to 160

Set number of data items to read with FOR...NEXT loop, then read three at a time into the variables A, B, and C.

Lines 170 to 190

Define envelope and sound parameters. The envelope 'shapes' the sound, while the SOUND command dictates how it is played.

Lines 200 to 340

150 data items to be read into the variables A, B and C. These are used as arguments to the SOUND pitch and duration parameters.

Take care when entering data statements, as many are decimal values less than 1. These are entered in the listing as point values only, with the leading 0 omitted: thus the value 0.5 has been entered as .5. If, on running, an 'Out of DATA' error message is generated you have almost certainly missed some items out of the data lines.

A way to help check your listing is to first set the column width to 40 before LISTing it using

WIDTH 40

This will now produce the same listing width as used in our printed version. The erroneous line can normally be found quickly by comparing the edges of your listing (printed or on the screen) with ours.

```

10 REM **** THE BROOK ****
20 REM ** (C) Acorn User **
30 REM *** August 1984 ***
40 REM * by Gary Pesticcio *
50 REM * & Darran Bristow *
60 REM *** for BBC Micro ***
70 REM ** will run on Elk **
80 REM ** but won't sound **
90 REM ** as good !      **

100 MODE 6
110 VDU 19;0,4;0;0;

120 PRINT ''
130 PRINT SPC(12)"THE BROOK"
140 PRINT SPC(10)"(c) Acorn User"

150 FOR N=1 TO 151
160 READ A, B, C

170 ENVELOPE1,8,0,0,0,0,0,0,0,121,-10,-5
-2,120,120
180 SOUND1,1,A-12,C*10
190 SOUND2,1,B-12,C*10

200 NEXT N
210 :
220 REM ** sound data **
230 DATA129,129,1,149,117,.5,149,101,.
5,149,117,.5,149,101,.5,129,117,.5,129,1
01,.5,129,117,.5,129,101,.5,137,121,.5,1
29,101,.5,137,121,.5,149,101,.5,129,117,
.5,129,101,.5,129,117,.5,129,101,.5
240 DATA137,121,.5,137,101,.5,137,121,
.5,137,101,.5,145,109,.5,145,101,.5,145,
109,.5,145,101,.5,149,117,.5,149,101,.5,
149,117,.5,149,101,.5,129,117,.5,129,101
,.5,129,117,.5,129,101,.5,149,117,.5,149
,.101,.5,149,117,.5,149,101,.5,129,117,.5
250 DATA129,101,.5,129,117,.5,129,101,
.5
260 DATA137,121,.5,129,101,.5,137,121,
.5,149,101,.5,129,117,.5,129,101,.5,129,
117,.5,129,101,.5,137,121,.5,137,101,.5,
137,121,.5,137,101,.5,145,109,.5,145,101
,.5,145,109,.5,145,101,.5,149,117,.5,149
,.101,.5,149,117,.5,149,101,.5,149,117,.5
270 DATA149,149,1.5
280 DATA145,109,.5,145,101,.5,157,121,
.5,157,101,.5,149,117,.5,149,101,.5,149,
117,.5,149,101,.5,145,109,.5,145,101,.5,
157,121,.5,157,101,.5,149,117,.5,149,101
,.5,149,117,.5,149,101,.5,137,109,.5,129
,.109,.5,137,109,.5,145,109,.5
290 DATA137,109,.5,145,109,.5,149,109,
.5,137,109,.5
300 DATA149,129,.5,149,129,.5,145,129,
.5,145,121,.5,129,117,.5,129,109,.5,149,
117,.5,149,101,.5,149,117,.5,149,101,.5,
129,117,.5,129,101,.5,129,117,.5,129,101
,.5,137,121,.5,129,101,.5,137,109,.5,149
,.101,.5,129,117,.5,129,101,.5,129,117,.5
310 DATA129,101,.5
320 DATA137,121,.5,137,101,.5,137,121,
.5,137,101,.5,145,109,.5,145,101,.5,145,
109,.5,145,101,.5,149,117,.5,149,101,.5,
149,117,.5,149,101,.5,149,117,.5,149,101
,.5,129,117,.5,129,101,.5,137,121,.5,149
,.101,.5,137,121,.5,149,101,.5,145,109,.5
330 DATA145,101,.5,145,109,.5,145,101,
.5
340 DATA149,117,.5,149,101,.5,149,117,
.5,149,101,.5,149,117,.5,149,101,.5,129,
117,.5,129,101,.5,137,121,.5,149,101,.5,
137,121,.5,149,101,.5,145,121,.5,149,121
,.5,157,121,.5,145,121,.5,157,121,3,149,
117,2

```

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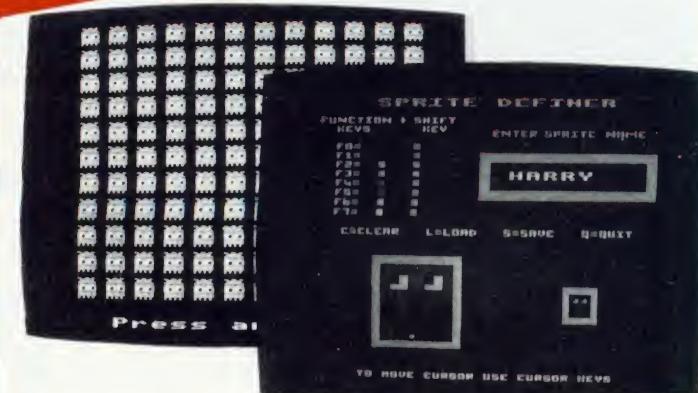
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COMMANDS

*CHECK	Verify a program or data in memory with disc/cassette.
*CLEAR	Clear all variables including integers.
*EDIT	Enter full screen editor.
*FREE	Display free memory and pseudo variables.
*HELP INFO	Display a screenful of useful system information.
*MEMORY	Display memory contents.
*MERGE	Merge a program in memory with one on disc/cassette.
*MOVE	Move program to run at specified address.
*NEW	As NEW, but can be issued from within a program.
*OFF	Cancel enhanced error handling.
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*UTIL 2	String search and replace.
*UTIL 3	Move Basic program lines.
*UTIL 4	List procedures and functions.
*UTIL 5	List values of A% to Z%.
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Doubling up with a second disc drive

BUYING a second disc drive was the subject of a letter from Mr N Smith from Stoke-on-Trent which wins him £5. He asked if it was possible to add a second drive to his single 40-track, single-sided drive ($5\frac{1}{4}$ in discs). The answer is yes, it is easy to do. The connections are straightforward, and only some links on the disc drive circuit board need changing for both drives to be accessed.

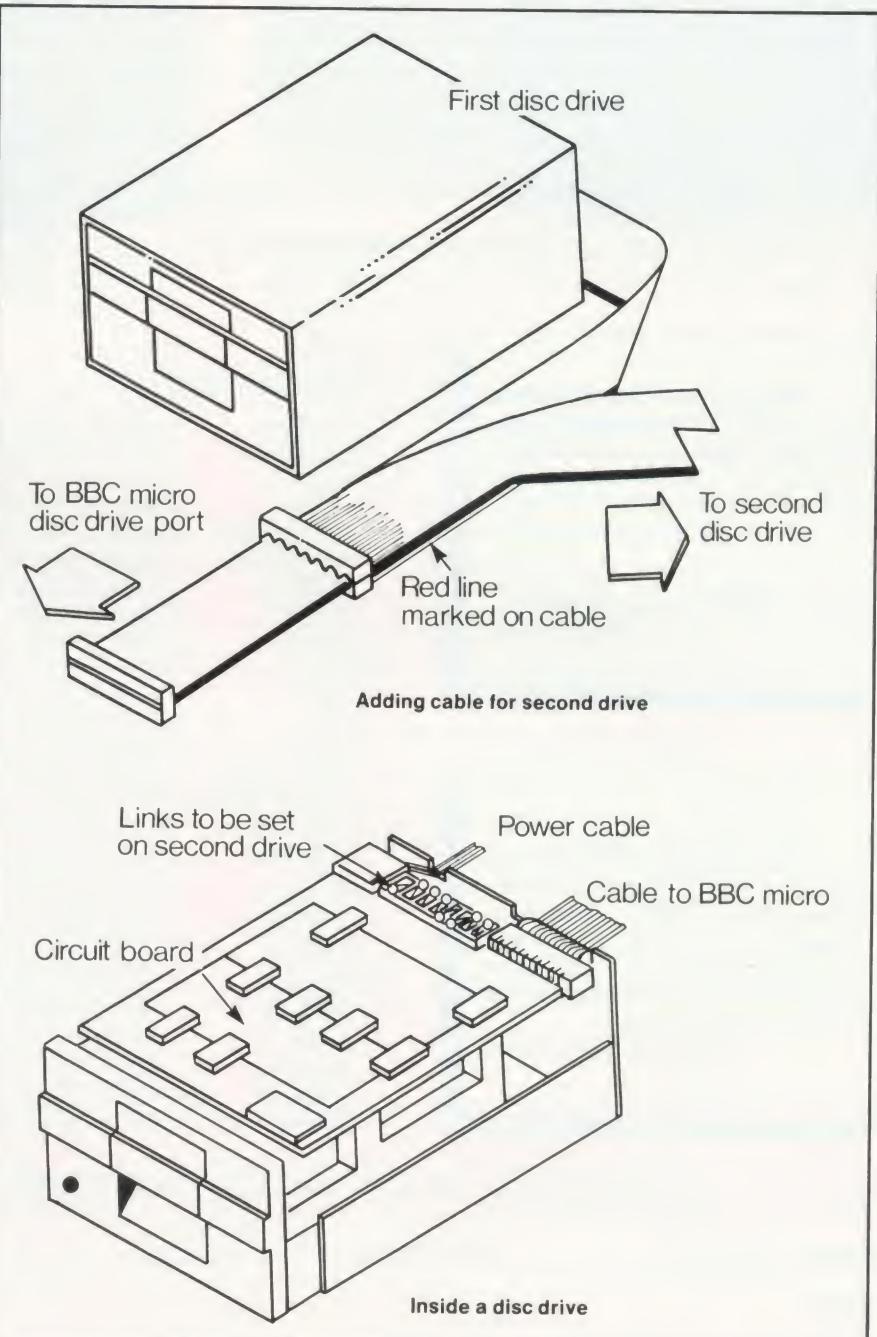
The major problem is one of power, unless both drives have their own supply. If the single drive runs from the BBC's power supply, then a second drive can be run from that too, but be warned, this is getting near the limit of the capabilities of the system. The easy answer is to buy a second drive with its own power supply.

The other alternative is to look at the adverts for suppliers of a single drive with power supply in a case designed to take two drives. Here readers should be aware of sizes. There are two $5\frac{1}{4}$ in drive sizes, full-height and half-height, and you can do this only with the half-height drives. These are about 4.5cm high, not including the case. I, in fact, bought a single drive in a double case, then bought a second drive when funds permitted.

The second drive can be 40 or 80-track, single or double sided and may not even be the same make, although this is advisable.

Once the power supply has been sorted out, the ribbon cable from the BBC's disc port to the drive needs to be altered to take the second drive. A second ribbon cable can be fitted on the first without breaking the connections using a Scotchflex 3365/34 or Amp 1-585717-5 connector. This can be fitted anywhere on the ribbon cable, but work out the best place for yourself before you actually do it. The new connector is put over the first cable, the top is put on

Martin Phillips offers his advice on second disc drives, lists commands for Epson printers and an answer to error messages



IF YOU have a technical hitch or a programming problem let Martin Phillips give his diagnosis. We'll pay £5 if you raise a really interesting point. Please give full details of the system you're using and include a listing where appropriate, making your question as specific as possible. WRITE TO: Hints & Tips, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

and the assembly squeezed together in a vice. If you have first disconnected the second cable from its drive plug it back into the edge connector on the disc drive circuit board. The colour marker on the cable should be to the right looking from the front of the drive when fitted, but check which way round the cable is in the original drive. As an alternative, a cable can be purchased with two connectors to suit a double drive.

Next, the links need to be set on the second drive's circuit board. These are sometimes in the form of a row of switches, or else a series of small links similar to those on the BBC circuit board. The common types of drive available are Mitsubishi, Tec, Teac and Canon, although more makes are coming onto the market.

There are two sets of links on the Mitsubishi board. Looking from the front of the unit, they are both situated at the far right-hand side near the edge connector. They are a series of pins with coloured jumper clips across pairs of terminals, and can be removed by lifting the clips off the pins.

The link set nearest the edge connector and at right-angles to it should be connected as follows:

	Bottom drive	Top drive
DS0	link	n/c
DS1	n/c	link
DS2	n/c	n/c
DS3	n/c	n/c
MX	n/c	n/c
HS	link	link
HM	n/c	n/c

DS0-4 are the drive selects. These can be changed, but the two drives must have different numbers. It is usual to only use 0 and 1, as the reverse side of double-sided discs use 2 and 3 without any further selection. HM and HS stand for head-to-motor and head-to-select. Either could be selected, but the normal one is HS. In other words the read/write head will only engage the floppy disc when that head is required to communicate with the computer. This is noisier and slower, but reduces wear on the disc and head. Also, it is not so likely to corrupt a disc if the unit is switched off with the disc still in place. The Tec drive does not have a head load solenoid, and so these links are not present. MX is the multiplexing link and should normally be unconnected. MX should always be left unconnected on the half-height drives but on the full height Teac drives this link is the wrong way round, and needs to be made. The half-height Teac drives have come into line with the other drives and do not require the link to be made.

The other set of links are the resistor terminator set. All floppy disc drives need to have the drive cable terminated by a resistor. If a second drive is being installed these resistors should be removed. On the Mitsubishi, they are a series of eight links in a row, near the other links, but on the Teac these resistors are in an IC-type package in

white labelled BECKMAN. This package should be removed from its socket. On the Tec this resistor is also mounted in an IC-type package and can be removed from its socket. As most of the ICs are soldered directly to the board and not socketed, these resistor networks are quite easy to identify. They are very near to the edge connector.

Translating printer commands

for Epson with Wordwise

AT THE request of *Dear Kitty* I include a list of printer commands for Epson printers being used with Wordwise (table 1). The printer manuals have to be written for a variety of computers, and as such need some translation for the BBC micro. Readers with other printers will no doubt find the codes very similar as there is quite good standardisation here.

If using the older Epson printers it might be necessary to include a 1 before each command (eg OC1,27,1,69). This will be necessary if using these commands with VDU statements for inclusion in programs (eg VDU1,27,1,69). The commands listed here are the ones I use most frequently. This list pinned up near the computer saves much time and effort.

OC14	Double width (one line only)
OC20	Cancel double width (one line only)
OC27,87,1	Double width
OC27,87,0	Cancel double width
OC27,52	Italics
OC27,53	Cancel italics
OC27,51,72	Double line spacing
OC27,50	Normal line spacing
OC15	Condensed mode
OC18	Cancel condensed mode
OC27,80	Pica mode
OC27,77	Elite mode
OC27,82,X	Alternate character set (English..X=3, American..X=0)
OC27,69	Emphasised printing
OC27,70	Cancel emphasised printing
OC27,71	Double-strike mode setting
OC27,72	Cancel double-strike mode
OC27,78,n	Skip-over perforation setting
OC27,79	Cancel skip-over
OC27,45,1	Underline mode
OC27,45,0	Cancel underline
OC27,83,0	Superscript on
OC27,84	Superscript off
OC27,83,1	Subscript on
OC27,84	Subscript off
OC27,64	Initialise printer. (reset)

Table 1. Translation commands. A list kept to hand saves time and effort

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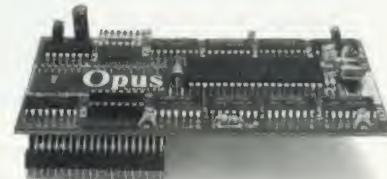
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A brighter way of changing background colour

ANDY HOLLIS from Exeter has sent in a simple tip to change the background colour when listing programs. There are several ways this can be done, but the way suggested is particularly neat and quick.

Keep the CTRL key pressed and press the keys:

V6SBA000.

This will get mode 6, and turn the background colour to red. Then the printing on the screen will appear in white with black between each line of print. This makes it easier to debug listings. Other background colours (including the flashing colours) can be obtained by changing the 'A'. For instance, 'D' will give a blue background.

This method of changing the background colour and mode cannot be used in programs, and the programmer will need to use the VDU statements in their more normal form.

Two techniques for turning the cursor off

SOME months ago, one of my more learned friends peered over my shoulder at a program I was writing, and exclaimed 'You're not still switching the cursor off like that! Haven't you seen the new command?' I almost gave up programming on the spot. However, I have since found that the 'old' method of switching the cursor off can sometimes be used to advantage over the newer method.

There are two ways of turning the cursor off with the BBC, and although one is not in the Electron manual, both work just as well on the Elk.

Diagnosing listings

Martin Phillips goes through some useful techniques to use when you find a program you've typed in doesn't work.

Turn to First Byte on page 33.

The one given in both user guides is:

Cursor off: VDU23, 1,0; 0; 0;
Cursor on: VDU23, 1, 1; 0; 0;

The BBC guide also says the cursor can be switched off another way:

Cursor off: VDU23;8202;0;0;0;

This latter method produces an interesting character on the screen. It turns the character to be copied the inverse of itself. However, it does have more uses and is more robust. The for-

mer command can be switched on again using VDU4 as well as the command given above. The only way to switch the VDU23;8202 back on is to change mode.

If you are writing a program that requires the text and graphics cursors to be joined and separated repeatedly (VDU5 and VDU4), then the latter method for switching the cursor off using VDU23;8202 is the better one to use as it needs to be used only once in the program (unless the mode is changed).

How to avoid memory problems

when switching from cassette to disc

WHY should programs that would run on cassette start giving error messages like 'No room' or 'Bad mode' on a disc system? asks Mr Winterton. Some programs seem to 'stick' when they get to the menu page and go no further.

The reason is that when a disc filing system (DFS) chip is fitted to a BBC computer it needs some memory of its own to store information. This workspace is just under 3k long, and it is taken from the memory normally used for programs. When the computer is switched on or break is pressed, the DFS grabs its workspace and moves PAGE, the position at which the user's program is loaded. On a cassette machine, PAGE is set to &E00, but on a disc machine this is moved to &1900. (Econet and teletext similarly grab some of the memory for their workspace if fitted.)

The problem experienced by Mr Winterton usually occurs in programs that use graphics and it is when a mode change occurs that the program now finds that it has not enough memory left, hence the 'Bad mode' error. Sometimes a program has an error routine that sends the program back to the menu or title page if an error occurs.

In this case, the program will appear

to cease functioning and remain at the menu or title page with the only option being to press the break key. If one then removes the error routine, the program will usually respond with the 'Bad mode' or similar error.

What can be done? Provided that there is enough memory space to load the program in from disc, then once loaded the program can be moved down in memory to start at &E00. Once this has been done the computer will think it is a tape machine, and so will be unable to then load a data file from disc. Also, pressing break will give a 'bad program' message, and the program will have to be reloaded from disc.

A short routine is shown in listing 1 which will move the program down in memory and then re-run it. This listing can be *SPOOLEd and then added to the program in question by using *EXEC with the program loaded in the machine. Then the program must be resaved on disc before it is run. Do check that the program does not use lines above 30000 or uses line 0. If it does, renumber it first. The routine uses line 0 to test if the program is loaded above &E00, and only relocates it if it is. Line 0 is used, as it is rare for a program to start here and so it is unlikely to overwrite any original program lines.

```
0 IF PAGE>&E00 GOTO 32000
32000 *TAPE
32010 FOR I% = 0 TO TOP-PAGE STEP4
32020 I% !&E00 = I% !PAGE : NEXT
32030 ??&13 = ?&13 - (PAGE - &E00) DIV256
32040 PAGE = &E00 : RUN
```

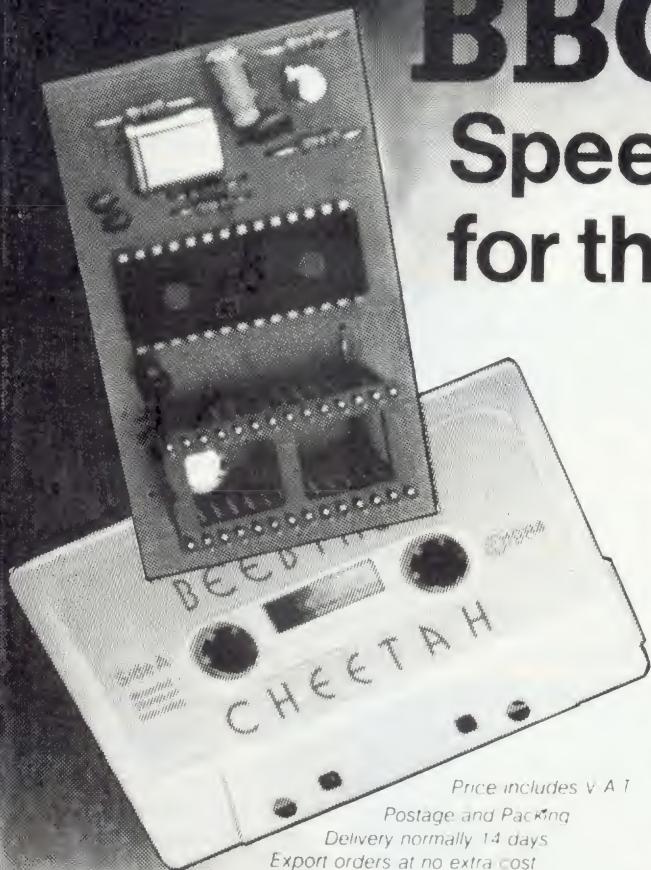
Listing 1. Shifts program down in memory

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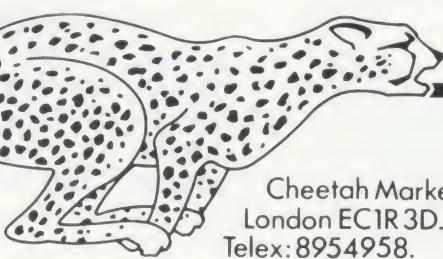
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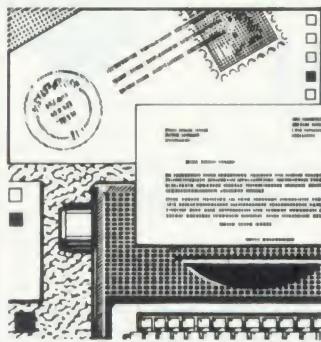
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Overwhelmed with software

Sir, Having read the review of Acorn's Z80 second processor, I wonder whether Acorn has 'scoured the world' for a 'rag bag' of software that will leave most serious users thinking where do they go next.

Acorn's marketing strategy seems to be to overwhelm potential customers with the sheer weight of software. Indeed one suspects that there is more paper in the package than electronic circuitry - so much for the paperless office!

One cannot help but think from the size of the software bundle, with its 11 separate items and high valuation of £3,000, that there is some desperation on the part of the software houses to sell their products, hence the enormous giveaway. It is interesting to note that not many of the more widely known products are being offered in the package, although some are mentioned as being suitable in your Q/A session.

Your brief description of the software seems to raise more questions than it answers. *Nucleus* looks very flexible, but why the need for *FilePlan* and does the latter then require the purchase of *MailPlan*? *MemoPlan* would seem to be a comprehensive word processor, although there is again the suggestion that a further package will be required to make the best use of it.

However, alongside it, *GraphPlan* looks positively crude, despite its colour graphics. With 50x20 cells, the latter is smaller than the cassette-based *Beebcalc* from Gemini. It has no split screen facility and does not appear to cater for linked worksheets such as those provided by *Multi Plan* from Microsoft. Finally, what use is a graphics package that is not actually used by any of the bundled software?

I would have preferred a

fully integrated suite of programs offered, which seems to have been the Torch and Sinclair approach, or, better still, a choice of suites for say small business applications, financial analysts, the serious programmer or scientific and technical applications.

Perhaps when you do a full review of Acorn's Z80 software, you could also do a comparison with the offering from Torch.

One question for Torch - is CP/N really fully compatible with CP/M and, if so, why needlessly confuse the potential customer with different terminology?

Robin A Richmond
Leamington Spa
Warwickshire

Second processor

problems

Sir, Having just purchased the 6502 second processor I find that none of my paged ROMs will work with it switched on, eg I am totally unable to use: *Wordwise*, *Graphics*, *Exmon*, *Micronet*, *Commstar*, *Toolkit* unless I have the second processor switched off!

It seems that Acorn has 'conned' me into believing the second processor is the best thing since sliced bread. Maybe it is, but having it is proving to be totally useless when one considers the usefulness of the above ROMs.

I suppose the suppliers of these ROMs may decide to rewrite them for the likes of me. I only hope they will take the existing ROMs in exchange, because having spent £200 on the second processor I'm not willing to spend around a further £150 to upgrade all the ROMs.

Also, when operating in Mode 7, why have I not got 71k of memory available? (26k from the existing BBC 'B' plus 45k from the second processor).

Will someone please explain why, with the second processor (operating in Hi-Basic) I have only gained 19k (45k-26k) and not a full extra 45k as mentioned in the second User Guide?

If, on switch-on, the original BBC 'B' Basic ROM is copied into the second processor, what's happened to the original 26k that I was able to use? The second Guide, chapter 9, 'Distinguishing between Mem-

ories' is no help in saying 'suppose you run a machine code program . . .' Suppose you don't. How do I recover the original BBC 'B' 26k of memory?

Anyone want to buy a brand new 6502 second processor?

I Crawford
Banbury

Difficult times

Down Under

Sir, As tales of would-be Electron owners lining up on cold December mornings to purchase their very own 'Cambridge Cabbage Patch Dolls' reach us in Australia (yes, the computer magazines are that far behind), I would like to tell the story of my own little Acorn, and maybe cheer up those who thought they were badly done by.

Firstly, no Aussie computer magazine mentioned the arrival of the Electron in this country. Everyone here buys either Commodores or Apple lookalikes. The Beeb has been available for some time, but its price has kept its numbers down. (The current Australian price is equal to just over £1,000.)

I'd read about the Electron in some English journals, and was on the verge of ordering one from England when I noticed that a Sydney Computer shop had them in stock. Expecting a rush, I hurried over.

Not only were there some left, none were yet sold. In fact the dealer said he was having a hard time getting people to look at them, let alone sell any. So I bought one.

Now I have no gripes about the machine itself. I have no need to sing its praises in your magazine. Even the interfacing (or the lack of it) has posed no problems. But don't talk about support . . .

Despite searching some six Acorn dealers (one of whom didn't know it was even though the distributor gave me its name and address), no Electron software was available. In fact this is still the situation some two months after buying the machine. The dealers told me to contact the distributors who said that they didn't have any and to contact the dealers.

The results was that the Acorn Electron must be the only computer on the Australian market with no software

support, and considering the number of Asian imports we get, that's not a bad effort. The available BBC programs are very limited, and not always compatible.

So I am left with a superb machine, an introductory cassette, and a pile of Pommy magazines with BBC and Electron listings.

I would like my full name and address to be printed so that any enterprising UK companies might like to let me know what they have for the Electron. And when I order software, don't bother with copy protection, because there's nobody else Down Under to even give the stuff up!

Earl White
5 Leopold St
Croydon Park 2133
Sydney, NSW
Australia

Second success

with Ultracalc

Sir, On page 84 of your May issue, Clive Williamson says that our spreadsheet 'Ultracalc' does not work with the second processor. It does! I have had it running on the other side of the Tube where about 5k extra memory is gained on a disc system.

David Atherton
BBC Publications
London W1

Serial printers

and the Atom

Sir, Way back in January '81, I purchased an Acorn Atom. Since then I have expanded it to 96K (at present) of which 42K is ROM; incidentally, I have been using 'sideways' principle since 1982; during this time I have discarded the original case, and changed the keyboard in favour of what was once an old Univac keyboard, so now I don't need to press shift to get punctuation.

Also, the old PCB did not lend itself to much modification so I rebuilt the circuit on plain RBP and used verowire.

I have rewritten the original ROM to give me 15 ports (inc ROM/RAM switching) between #B040 and #B3FF and a text start at #0C00 plus a few other uses.

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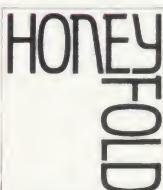
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As a little diversion, may I point out that on page 121 of your June issue Vincent Fojut is totally wrong as to using a serial printer on an Atom; I am currently using an ITT Envoy printer, and have used Creed 7B teletypes, both of which are serial formats.

Anyway my question is one of name. Is my machine an Acorn Atom or not?

N J Tubb
Crawley
Sussex

PS. If you are wondering about the FP using #2800, I've also rewritten that to use #0B00 instead.

Vincent Fojut replies: I actually said that 'a serial printer cannot be used directly with the Atom.' That is, unlike the Beeb, you cannot plug a serial printer straight into a standard, unmodified Atom, and expect it to work.

This is not to say that it's impossible to drive a serial printer from the Atom – but you must develop (or purchase) additional software and/or hardware to make things work, as you will undoubtedly know from your own experience.

Other readers, who don't want to do the work themselves, may like to know of the Disatom utility ROM by Procyon. Amongst other things, this enables you to use the Atom's cassette port as an output driver for serial devices. Contact: Focusplan, 57 Westgate, Cleckheaton, W Yorks BD19 5HH.

Misleading

test programs

Sir, I would like to correct a misunderstanding about the relative speed of using GOSUB or PROC on the BBC computer and Electron in Gary Smallridge's article 'Basic increase in speed and space' (*Acorn User* June). In this Mr Smallridge states that using GOSUBs is faster than using procedures, contrary to the statement in the *User Guide* (page 195). He gives a program that proves this.

Unfortunately, this type of test program is misleading because of the different way

the interpreter handles the two types of routine call. For GOSUB the interpreter searches through the program from the start until the destination line number is found. The time taken depends on the position of the routine in the program. For a short program like the test the GOSUB call can be quite fast, but as the program becomes longer the speed deteriorates rapidly. In contrast, after the first reference to a procedure the interpreter 'knows' the location of the procedure definition and can call it directly without having to search. This means that in practice procedures will be much faster.

A more realistic test program that demonstrates this is given in figure 1, with results for varying program lengths. For programs where the subroutines are beyond the fifteenth line procedures are faster and for longer programs the difference becomes substantial. The speed of a procedure call is essentially independent of the size of the program.

Robert Tidey
Middlesex

Undocumented

op codes

Sir, The suggestion that certain undocumented 6502 op codes are 'newly discovered' (*Atom Forum*, June) is somewhat wide of the mark.

Several articles have appeared on this subject, the earliest I can find being in Byte as far back as December 1977!

However, full marks to Barry Pickles for resurrecting the subject and for producing a very useful table.

It should be noted that the 65C02 (plug compatible with the 6502) does use some of these, including all the x7 and xF codes.

Finally, has anyone installed a 65C02 in one of the Acorn machines?

Geoff Smith
Worcester Park
Surrey

When experts

are in error

Sir, I am saddened to see an otherwise excellent magazine

```
10 TIME=0:FOR I%=1 TO 1000:GOSUB 1000:NEXT
15 PRINT TIME/100:STOP
100
101
102
.....Variable number of lines containing one space
```

```
10000 RETURN
20000 DEFPROC:ENDPROC
```

Number of lines	GOSUB	PROcedures
1	0.46	0.69
5	0.52	0.69
10	0.60	0.69
50	1.18	0.69
100	1.92	0.70
500	7.8	0.70
1000	15.16	0.70

```
10 INPUT "NUMBER OF LINES",NL
20 PAGE=PAGE+&100
30 FOR NX=100 TO NL+99
40 !I=&5000000+(NXMOD256)*&10000+(NXDIV256)*&100+13
: I?4=32:I=I+5
60 NEXT NX
70 !I=&FF0D
```

Figure 1. Robert Tidey's program (top) for testing execution of GOSUB calls. To test PROCedures replace GOSUB 1000 with PROCA. The results for different numbers of program lines are shown. The other program was the one used to create the dummy lines in the test program

spoilt by the inclusion of articles which contain statements that are inaccurate and in some cases simply incorrect, particularly when these articles are written by professional programmers to help the 'less adept' amateur. In particular, Gary Smallridge's article in the June issue contains several such errors.

In section 7 he advises users not to 'start variable names or procedure names with the same letter'. While this is excellent advice for variable names, it will have no effect on procedure or user-defined function names. This is because of the way these are stored in memory. The Basic interpreter has 28 linked lists for accessing these names, one for variables starting with each letter of the alphabet, one for procedures and one for user defined functions. It is faster to spread the variables between these lists but as procedures and functions have their own lists no gain is obtained with this technique.

In the section on saving memory he states that 'in BBC Basic a real number will use five bytes of memory whereas integers (eg, 1%, FRED%) will use only four.' In fact there are three types of numeric scalar variables (ie single numbers, excluding arrays). These are the resident integer variables, normal integer variables and real variables. The resident integer variables, as he points out earlier in the article, require no additional memory as they are already declared in reserved locations. Normal integer variables require the length of the name, including the '%' plus six additional bytes, four to store the value and two to store the pointer to the next variable starting with the same letter.

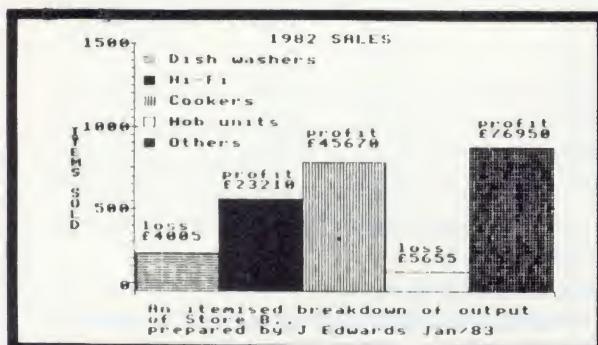
Although the first letter of the name is not stored but implied from the linked list in which the variable occurs, an additional zero byte is required as the terminator for the variable name. As such the variable FRED% would require a total of 11 bytes of memory. A real variable, as he suggests, does require an additional byte to store the value giving a total of the length of the name plus seven additional bytes. However, as there is no terminator on real variables, this saves one byte, giving the same amount of memory required for variables with the same name. A real variable FRED would still require 11 bytes of storage.

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	Expenses 101	
	Net Profit 720	
	% Gain = 36	

SHARE ANALYSER FACILITIES

DISK CASSETTE

No of prices stored	20,000	Appx 1700
Max no' of Holdings	20	20
Transactions per holding	16	16
Range adjuster	YES	NO
File Manager	YES	NO
Printer Manager	YES	NO

REPORTS PRODUCED:-

Portfolio Valuation	YES	YES
Portfolio Profit Analysis	YES	YES
Share Profit Analysis	YES	YES
Share Movement Analysis	YES	YES
Transaction Record Report	YES	NO
File Status Report	YES	NO

GRAPHICS FACILITIES:-

Magnification option	YES	YES
Grid	YES	YES
Autoscale	YES	YES
Screenwrite	YES	YES
Screendump	YES	YES

SELECTABLE GRAPHICAL INDICATORS:-

Lagged Moving Average	YES	YES
Centred Moving Average	YES	YES
Rise and fall indicator	YES	YES
Weekly/Daily Low indicator	YES	YES
Superimpose Facility	YES	YES

There is only a saving in memory made when integer arrays are used instead of real arrays. In this case one byte is saved for every element in the array, less the extra byte required in the name.

Although I understand it is difficult to check the accuracy of the information in every article, I would like to state that this quality of writing tends to reinforce the opinion held by many people that so-called 'computer experts' have little more ability in the field than most people who have just bought a home micro but have not yet learnt the jargon.

Mark Simms
Bristol

and you should find that all will be OK.

M Clayden
Merseyside

Tape loader

Sir, The listings for 'Tape Loader' in *Acorn User*, June are not the final versions of the program. They contain at least one error and if the main program is 'pruned' as suggested in the accompanying article it may subsequently crash. The changes given in figure 2 should make the program run correctly and more smoothly.

John Bexon
Kent

```
LISTING 1.
50 LOMEM=TOP+$B0:
TP%=$D0-1
80 *KEY10 OLD:
MEND:MRUN:M
320 R%=$NC(TP%)
630 RESTORE 1002:CT%=-1
:CLS:PRINT**"Programs
on this tape are:
-",";L%=$NC(TP%
In line 750 instead of
KEY f0 use BREAK

Listing 2.
80 *KEY10 ?&21B=&DC;
?&219=&D:&20A=&D6:
?&20B=&D:OLDIMEND:
MRUN:M
```

Figure 2

High rollers

Sir, I have an idea to improve your magazine, that is if you can improve on perfection (creep, creep). It came to me (the idea that is), while reading B Nesbit's letter in your June issue. How about keeping a list of the highest scores achieved by readers at various popular games?

Mark Coles
Birmingham

A number of readers have written in to boast of their performance in various games. We list the high scores below to get the ball rolling. Record-breakers please write in.

Mark Coles			
Rocket Raid	39,780	Meteors	22,980
Snapper (keyboard)	131,810	Chuckie Egg	1,048,820
Danger UXB	320,750	Pengo	35,790
Overdrive	55,210	Crazy Painter	55,240

Stephen Green			
Android Attack	602,590	Arcadians	27,300
Starship Command	2,059	Zalaga	111,930

Robert Hirskyj			
Planetoids	346,775		

ASK a silly question, pass a fair comment, stage an angry protest - we don't mind what you write to us about (or about us!). Keep 'em short, keep 'em sweet, but keep 'em coming! The address is: Letters, *Acorn User*, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

Kitty answers

the simple
questions that
confuse many



sor - and you'll never want to touch a typewriter again! It's also very handy for mailing lists and other time-consuming repetitive tasks.

Going one stage further, a Z80 second processor will turn your Beeb into a proper business system - accounts, stock control - virtually everything a small business could need.

Some of the articles in this issue may set you thinking about education, and teaching your children, which is something else a micro can do.

But remember, a computer for most people becomes an end in itself: it just replaces watching TV, or tinkering with cars, or doing crosswords.

Q Having saved up nearly five hundred pounds to buy a BBC micro and the bits to make it work, I was expecting not to have to spend any more. Little did I know that it would continue to be a drain on our holiday money. It seems my family will never stop wanting more software and add-ons! What I want to know is whether the micro is going to be a passing fad like skateboards or roller-skates?

Michael Fernandez
Dorset

Q Most of my friends at work have got computers and seem to talk about nothing else. What use are home micros? When I ask what use they are, all I get are evasive replies - as if none of my friends want to admit that they are of no use at all. Can this be true?

Nicholas Spencer
London

A It all depends on what you mean by useful. As an aid to logical thought, yes, they are useful. However, a Beeb on its own (with no add-ons) is useless for so-called usefulness - it won't run the central heating or manage your household budget. That said, a lone Beeb is useful in that it gives you an interest and stops you watching so much TV; if you get involved in graphics it will brush up your geometry - it's also just plain fun.

If, though, you have some add-ons (printer or discs) then it can become a wordprocess-

A I just wish someone did know the final answer to this question! A home computer is certainly different from other toys; it doesn't have to be used just as a toy and there are plenty of useful things it can do.

Second, a computer is more like Lego or Meccano than a pair of roller-skates. You can build many different things around it and it is only really limited by the imagination of the user.

For the home computer to die out a better toy must come along: it's difficult to imagine a more versatile one.

The company which brought you the first self-build Arcade game and the first Adventure with sound, just had to be the one to give you the very first QUEST for the Beeb!

Swords and Sorcery

a new experience ...

QUEST programs originated on the American mainframe computers, and were converted to micros, though requiring so much memory could only be made to work on expanded Apple micros and the like. Now, Kansas have crammed a full feature Quest into 32K, giving every BBC Micro owner the opportunity to play and experience these unique games.

So what is a Quest? Think of an Adventure, then think of very much more. A Quest is operated similar to an Adventure, but no longer are you alone, starting with three helpers. As you progress you will encounter many other characters, but unlike an Adventure program were all characters are passive, these can be either hostile, friendly or indifferent. If hostile you have to fight, and quickly; if friendly they may join your team bringing more strength, magical ability and carrying capability; if indifferent you could perhaps try a bribe (but beware if you offer too little) or you could sell an object and raise yourself more cash as well as lessening your load.

But most of the effort is your own, with treasure, money, magic and strength all having a bearing on your progress. At times it will pay to be vicious and abandon your friends as they become weaker, or even go in fighting before characters show their true colours, the element of surprise using less strength.

As can be expected in Swords and Sorcery there is a story:

Once upon a time in a far away land called Iriuma a magical Princess cast a spell of banishment on the wicked Sorcerer Brogelt. However, just before the spell took effect, Brogelt threw his arms into the shape of changing and cast a return spell, changing princess Illear into a diamond. Taking the diamond with him, Brogelt took sanctuary in the Dungeons of Terror amongst the various monsters and demi-humans. Here he split the diamond into four parts and changed each part into a different crystal. Brogelt then hid each crystal in the dungeons never to be found again. When the king heard of this he summoned all his faithful Knights to him and offered half his lands for the four crystals. Sadly they all perished in the Dungeons of Terror attempting it. Now the king has offered anyone his other daughter's hand together with half his lands. Hearing this, you set off to the king's palace to offer your services. The king is astounded but nevertheless offers you a party of three prisoners from his jail, promising them a full pardon if they will go and aid you. As you leave the king stops you and thrusts a scrap of paper into your hand explaining that it contains the location of each part of the crystal from the entrance of the dungeons. It was written very shakily and stained in blood. The king says: "Let me introduce you to the three prisoners that I have volunteered to go along with you..."

The characters you meet include a Troll, Orc, Thief, Dwarf, Goblin, Madman, Witch, Hobgoblin, Mad Monk and of course the wicked wizard himself, all in fact you would expect in a magical Swords and Sorcery...

All the objects have a use, but be careful, for picking the Dragons Tooth could be fatal; though if you find the Staff of Healing try and get it; an Idol of a forgotten God should be left well alone; the Ring may help you; the Magic Axe certainly will; the Old Book will give some clues; rub the Glass Ball; used properly the Magic Carpet will get you out of trouble; the Rolled Scroll too is useful; but not so the Fools Gold; be careful with the Bottle of Liquid; but drink the Magic Potion; treat the Golden Orb with care; but of course the Sword is the greatest help of all. And so it goes on, and on and on...

Unlike an Adventure game, were once you have solved the plot, and it is all finished for good, Swords and Sorcery generates an entirely different scenario every time, even though totally logical! But if you really intend to see a game right through to the end, the game saving facility allows you to do this, playing the same scenario, time after time, to its end. It is so different from an Adventure, that it actually has nine—yes nine—levels of play, with the ninth having so many locations and of such complexity, that we would be amazed if anybody ever solved it!

If you are an Adventure addict, this will really spoil you! If you do not care for Adventures the activity in this unique game will suit you as well. It is one of those you just will not be able to leave alone...

Though there are many Adventure games using the word Quest in their title, these are not Quests in this, the true sense of the word, but are just ordinary Adventures.

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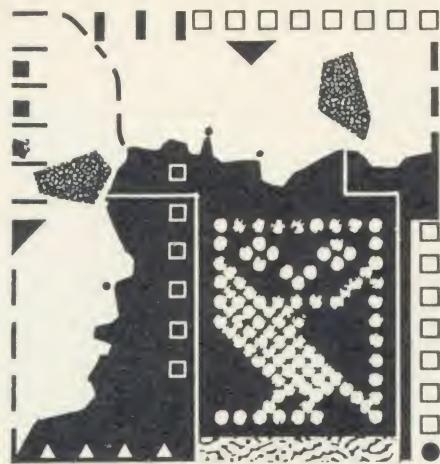
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Access information without peeking or poking

THERE are three items, says Ellis Thomas, in January's Beeb Forum which, though apparently unconnected, have an underlying factor: the ability to access information legitimately without peeking or poking.

First, the cursor problem in 'Less Peeking'. The *Advanced User Guide* tells us (page 15) the codes placed in the input buffer for the soft keys, so the cursor keys can be driven from running programs by placing the relevant code in the input buffer to be acted upon, using *FX138,0,N (cursor editing must be enabled, of course, see *FX4). The relevant codes are:

```
&8F 143 ↑
&8E 142 ↓
&8D 141 →
&8C 140 ←
&8B 139 COPY
```

So we can not only position the cursor, but also do the copy from the running program, leaving the characters in the input buffer as if we had used cursor and copy keys from the keyboard. The only problem is that the starting point

Bruce Smith is in charge as readers chip in on legitimate access, printer toggling, file sizing, plus tips on Wordwise

for cursor movement is that defined at the time of input (INPUT or GET\$), not that at the time the codes are placed in the buffer. The example given can thus be replaced by listing 1. The prompt @? is followed by the copied string, awaiting modification by using delete, or addition of characters prior to input by pressing return.

```
1090REM by Ellis Thomas
1100DEFPROC@Cat
1110LOCAL C%: C%=0
1120Name$=""
1130*FX15,1
1140*FX4,0
1150*FX138,0,143
1160REPEAT
1170Name$=Name$ + FNCopy(" ")
1180C%=C%+1
1190UNTIL C%>=10
1200Rest$=""
1210REPEAT
1220Rest$=Rest$ + FNCopy(CHR$-1)
1230C%=C%+1
1240UNTIL C%>=39
1250ENDPROC
1300DEFFNCopy(Dmt$)
1310LOCAL C$
1320*FX138,0,139
1330$=GET$
1340IF C$=Dmt$ THEN =""
1350=C$
```

Listing 2.

This brings us to 'Cassette space'. The table of addresses in memory page 3 is given in the *Advanced User Guide* (page 279). Here we see that we can use OSBYTE &A0 to access these values, which presumably makes us Tube compatible, and safe from this

data being moved to another page in a new operating system. However, we are left with the problem of reliance on the layout within the page. An alternative approach is to read the file details from the screen using cursor and copy keys. Changes to the screen layout will at least be obvious to see in a new OS. Listing 2 gives an idea of how to read the file name and so on from the screen immediately following reading the file with *LOAD, using *OPT1,2. A call to PROCCat yields the name in Name\$, and the addresses in Rest\$:

```
Block No - MID$(Rest$,2,2)
Length - MID$(Rest$,5,4)
Load add - MID$(Rest$,13,8)
Exec add - MID$(Rest$,22,8)
```

The FNCopy enables us to omit a nominated character so that the trailing spaces on the filename can be easily avoided; use of GET\$ avoids the copied characters being printed. Using these procedures, a utility to copy a cassette file automatically for back-up has been readily constructed.

Finally, 'Locked for program protection' had a problem placing the token for OLD in the input buffer. The reason for this is that the OLD token is &CB (203). When an attempt is made to place it in the input buffer, this behaves as &8B (139) which is copy, so no character is actually placed in the input buffer, the same as when copy is pressed without having pressed a cursor key. The set of codes appears to be repeated every 16 up to &FB - &FF.

**Printer on, £10
Printer off**

C BINSTEAD of Andover wins himself £10 for this useful machine code utility. We'll let him explain ...

The interrupt routine in listing 3 (yellow page ii) will possibly be of more use to disc users than readers with cassette-based systems, although the latter may find use for it. PRTGCLR was originally written for use with the *DUMP statement to enable printer dumping of selected sections of the output.

page 70►

```
10 REM Copy from running program
20 REM by Ellis Thomas
30 CLS: PRINTTAB(1,2)"ABCDEFG"
40 FOR X%=5 TO 3 STEP-1
50 REM Up cursor
60 *FX138,0,143
70 NEXT
80 REM Left
90 *FX138,0,140
```

```
100 FOR X%=1 TO 7
110 REM Copy
120 *FX138,0,139
130 NEXT
140 INFUTTAB(0,5) "@", A$
150 PRINTTAB(0,10) "Input
was"""; A$; """
160 END
```

Listing 1.

Beeb Forum is a platform for ideas, tips and applications relating to the BBC micro and the Electron, intended for experienced programmers to share their thoughts. For every reader's tip published we pay £5 – or more for something special. Contributions should be typed or printed, with substantial listings on cassette. WRITE TO Beeb Forum, Acorn User, Redwood Publishing, London WC2E 9JH.

SECONDS

5
3
0

Robin Newman
finds a way

around trouble
with the Tube

66

HAVING recently acquired a 6502 second processor, I have been finding out the hard way the validity of the warnings given by Acorn concerning the use of direct memory addressing in programs, which can make them unusable in a second processor. The problem occurs in any program which tries to do one of the following:

- Directly 'poke' or 'peek' the screen. This is now in the BBC machine (the input/output (I/O) machine) memory map, whereas the Basic program will be running in the 2P (short for second processor). You will be peeking or poking 2P memory with unpredictable results.
- Directly accessing the user VIA addresses. These are also now in the 'wrong' processor memory map.
- Using unofficial pointers like &F4 which contains the currently selected ROM identity. Note that using Basic pointers like &18 for PAGE and &12,&13 for TOP still appears to be OK (though undesirable?) as Basic maintains its pointers in the 2P memory map.
- Using programs which maintain data areas at &A00 or &C00. As the default value of PAGE is &800 in the 2P, this will cause these safe data areas to appear on top of the program, thus destroying it! Note that user-defined characters are still stored in the I/O memory map, as are function key definitions, so neither can be accessed by direct peeking using the ? operator.

What then can be done about these problems? Most are easily avoidable, albeit at the expense of slightly more involved programming. It is possible to directly peek or poke a memory location if you use the legal method. This uses OSWORD with A% = 5 for peeking and A% = 6 for poking. Examples are given in the 2P handbook, and these calls are also detailed in the *User Guide* (p460) and the *Advanced User Guide* (p249). To access the user VIA, or other devices in the FRED, JIM, and SHEILA pages of the I/O memory map, OSBYTE calls with A% = 146 to 151 can be used (*UG p436, AUG p170*).

Having converted one or two of my own programs to work with the 2P, I turned my attention to the commercial sideways ROMs which I had access to. Sadly many of these would not work. (The Acornsoft ones like View and BCPL did!). Often the problem appeared to be trivial. Directly poking a help or menu page to the screen, for

example. However, many of the monitor-type ROMs which incorporate a facility to dump or disassemble other sideways ROMs would not perform this task correctly. The reason is not hard to see. Sideways ROMs are selected by writing their slot number to location &FE30 in the I/O memory map, which contains a write-only switch. A record of the state of this switch is maintained in location &F4. The monitor ROM copies a routine into RAM which then switches these locations to the ROM you desire to inspect, and then accesses it usually using indirect-indexed addressing, before switching back to the monitor ROM. However, when such a sideways language ROM is selected with a 2P installed, it is copied across to the 2P automatically, and then executed in the 2P memory space. Thus the switch at &FE30 and the copy at &F4 are not available, as they are in the wrong memory map!

Thus to use this facility from the 2P, it is necessary to access &FE30 and &F4 in the I/O memory map, and to read the required ROM data, again in the I/O map, before sending the resulting information back to the 2P. This requires a certain amount of machine code to be resident in the I/O memory map to carry out the task. There are two problems. First how do you get the code there, and second, how do you execute it? There are two solutions to the first problem. The code can be loaded directly from tape/disc/net into the I/O processor rather than the 2P by using an eight-digit load address with the first four digits set to &FF. Thus if the code should reside at &1500 in the I/O map, then type *LOAD progrname FFFF1500. (To load it into the 2P set the first four digits to 0-*LOAD progrname 1500 or *LOAD progrname 00001500). The second method is to prepare the code in the 2P and then use OSWORD 6 to copy it across byte by byte.

The second problem, how to execute the code in the I/O processor, is solved as follows. The beginning of page &200 in both processors memory maps hold a series of vectors through which various operating system calls are indirectioned. The particular one of interest is the USERV vector located at &200 in the I/O memory. This is used by the commands *CODE and *LINE, which have been discussed before in *Acorn User* (November 1983 pp 51-53). Alternatively, OSBYTE 136 can be used to access this vector. The vector contents in the I/O memory map are altered

(using OSWORD 6) to point to the code which has been poked across into the I/O memory. The code can then be executed by calling OSBYTE 136 in the 2P.

The example program (yellow page vii) uses this technique to allow you dump the first 'page' of a sideways ROM onto the screen.

PROCwrite(data,addr) writes the byte 'data' to the I/O memory address 'addr'. FNread(addr) reads the contents of the byte at 'addr' in the I/O memory. PROCstarcode performs a *CODE command, using OSBYTE 136. This calls the machine code routine which has been placed in the I/O memory by PROCover. The code consists of the following instructions:

```
JSR &FFB9
STA &F6
RTS
```

The routine &FFB9 (OSRDRM) is contained in the 1.2 OS ROM. It is documented in the *AUG* on page 106. On entry the Y register contains the ROM number to be accessed, and the routine returns with the byte whose address is contained in &F6 and &F7 in the accumulator. For those who dislike using this unofficial OS routine, it essentially contains the following code given in figure 1 (yellow page vii). If desired, this can be substituted into the data statement at line 510, provided the count in line 460 is changed accordingly. Thus lines 460 and 510 would be changed, as in figure 2 (yellow page viii).

Finally, for those who do not have a 2P, program (yellow listing page vii) will run on a stand-alone BBC machine without modification, provided it has OS 1.2. The code which is accessed by the USERV is located at &2200 onwards, which is clear of the top location used by the program, even if PAGE is &1B00 (for a disc + Econet machine). It is also clear of the highest location used by the 2P. This uses an extra &600 above the default page value, as the character font is automatically fully exploded, (equivalent to a *FX20,6 command) allowing any ASCII character to be redefined. (Note: If you have a sideways ROM board fitted, you can change the range of R% in lines 50 and 60 to 0-15.)

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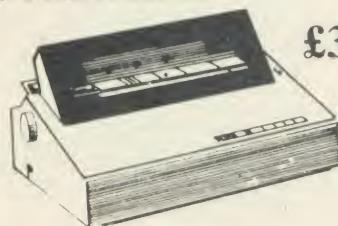
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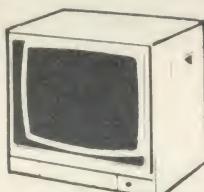


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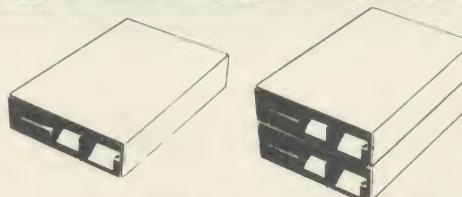
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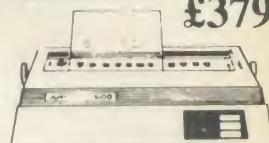
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NEW CHIP WITH TUBE

68

What follows will, initially, only be of interest to those who have acquired a DNFS ROM as part of the 6502 second processor package. However, as this chip is being 'rommed' it seems likely that it will supersede the DFS 0.9 and NFS 3.34 chips which have to date been supplied with disc and Econet interfaces, and thus become of wider interest.

The DNFS chip supplied with 6502 second processors can in two senses be described as three in one. First, it contains three separate sections of code. A disk filing system, a network filing system, and code to set up the Tube interface to the second processor. This latter section of code (some 400 bytes long) is automatically copied down to pages 400 to 700 of the input/output processor (the original BBC computer) if the Tube hardware is detected on power-up (or CTRL-BREAK). The first 8k of the 16k DNFS ROM also contains the Net filing system, while the disk filing system software largely resides in the second 8k of the ROM.

Because two filing systems are in the same ROM, provision has to be made to disable each one separately, as the combined ROM may be used in machines which have only one (or even neither) of the two associated hardware interfaces fitted. A software switch has been incorporated in the ROM to do this.

During the power-up sequence the ROM receives two service calls to allocate the memory required by the filing systems it supports. It is these which cause (among other things) the default value of page to be adjusted to 1200 (NFS only supported), 1900 (DFS only), or 1B00 – both NFS and DFS supported. (This assumes the second processor is not connected, although such memory allocations still take place in the I/O memory map if it is, although they remain hidden from the user in that case.)

The service entry at 8003 points to &80F7. Inspection of the code from that address onwards finds the service call (code 1) for allocating memory to the NFS at &8105. Initially this tests for the presence of the 68B54 Advanced Data Link Controller chip which is the heart of the Network hardware interface. If the test fails, the most significant bit of the byte allocated to the ROM in the workspace table from &DFO to &DFF is set. This is tested on subsequent calls to the NFS and if set it causes all such calls to be ignored: ie the NFS does not

DNFS chip reviewed by Robin Newman

appear to be present in the ROM. Thus if the user sets this bit directly, the NFS can be effectively switched off, and will remain so until the machine is switched off again (or the bit is directly reset).

A similar test is made at the start of the code servicing the DFS (from &B494 onwards). In this case the status register of the 8271 (at &FE80) is read. According to the 8271 data sheet, this will always return 0 in bits 0 and 1. However, if the 8271 is not fitted the data lines will be pulled high and these bits will both be a 1. In this case the code ignores calls to the DFS. However, it appears that a software switch is also provided to cause DFS calls to be ignored. Code at &B49C tests bit 6 of the same byte that contains the NFS ignore flag. If bit 6 is set, the DFS call is ignored. I have not yet found where this is used in the ROM, but the user can take advantage of this facility directly to disable the DFS if required.

So much for the background, but of what use is this all, and how in practice is the disabling/re-enabling carried out? The advantage of the disabling is that it is possible with a simple software 'poke' to change the configuration of your machine so that it behaves as: a machine fitted with only a DFS; a machine fitted with only an NFS; or as a machine fitted with no additional filing system, ie a standard tape machine, (with sideways ROM support). In each case, the default value of page (the system OSHWM) will take up the value it would have for the particular system concerned, thus releasing valuable memory space for the user. The only way to do this with the old discrete DFS and NFS is to physically remove some chips, as it is no good using the dodge of putting a 0 in the relevant position in the ROM type table at &2A1-&2B0, as this will be reset

when the break key is pressed, and so you could not push break to reset page and the default filing system. Thus the second claim for this DNFS ROM as being three in one becomes apparent. With its help and a simple software command, your machine can be quickly turned from a simple tape machine to a disc-only or network-only machine, or to a full-blown disc plus net machine (assuming the machine has the relevant hardware interfaces). One example is when using a 'tape'-based program from disc. After loading, the DFS is disabled, and the program relocated to &E00. It can now be RUN in the correct environment, and (unless it is protected) will survive break.

Now for the 'how'. First, a word of warning, particularly to games addicts. The process can happen inadvertently if you use a program which uses page &D00. The disabling flag is contained in a byte between &DFO and &DFF (dependant upon the position of the DNFS ROM sideways 'slot'). If the game or other software corrupts this byte, you may find when you push break or CTRL-BREAK at the end of the game, that your DFS or NFS has totally disappeared, and that you can only get it back by switching the machine off and on again! (In fact it is possible to retrieve the situation with a memory 'poke'.) The first thing to ascertain is the position of the DNFS ROM in the available sideways ROM slots. Mine is situated next to the Basic ROM in the slot second from the right-hand edge of the circuit board. This is slot 13 or &E, and in this case the relevant byte in the workspace table is &DFO + &E which gives &DFE. This location will be used in the following description, but change it to your DNFS slot.

To disable NFS. This requires the msb of &DFE to be set. The 'nicest' way to do this is to type:

?DFE = ?DFE OR &80 <return>

Alternatively, look at the contents of &DFE (using P. ~&DFE <return>), which in my case gives &17, although this may differ depending upon your machine configuration, and then add &80 to this value, giving &97, before

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I WOULD like to acknowledge the help I have received from three sources. First Acorn (yes they do answer the telephone and are helpful with technical enquiries), second, Chris Dawkins of Felsted School, and third, but by no means least, the *Advanced User Guide*, pp 246 (*FX255 details), 273 (paged ROM type table), 281 (paged ROM workspace table), and 320–321 (service calls types 1 and 2).

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As the routine (listing 3) was written for a disc system, it is located at &A00 although you may wish to move it to suit your own purposes. This can be achieved simply by changing the contents of the vector contained in lines 190 and 200. When activated by pressing the escape key, the routine investigates the contents of location &70. If it contains 0, a VDU 2 is issued (line 80) and a 1 stored at &70. When this location contains 1, a VDU 3 is sent (line 110). The two linefeeds that are sent after turning the printer off (lines 130 and 140) are there to tidy up the output, as it is unlikely that printing will be halted exactly at the end of a line.

Line 50 performs a *FX126,0 to acknowledge the pressing of escape, line 210 sets the initial contents of &70 so that the first interrupt will turn the printer from off to on and line 220 enables the 'escape pressed' event. While the routine is in action the escape key will only perform the action of switching the printer on and off. To return the key to normal usage, turn off the interrupt by typing *FX13,6.

How big is my file?

OFTEN it is useful, says Mr Davies from Horley, to determine a file's size (or whether it exists or not!). This is normally quite difficult to achieve within a Basic program, but the function in listing 4 (page ii) will return the filesize including zero if the file does not exist.

Listing 5.

```
1000 DEF FNread(fi%)  
1010 LOCAL a$: a$ = ""  
1020 REPEAT  
1030 a$ = a$ + CHR$(BGET#fi%)  
1040 UNTIL (RIGHT$(a$) = CHR$&OD) OR (EOF #fi%)  
1050 = a$
```

Listing 6.

```
100 fi% = OPENIN("filename")  
110 REPEAT  
120 data$ = FNread(fi%)  
130 PRINT data$;  
140 UNTIL EOF #fi%
```

Listing 7.

```
2000 DEF PROCwrite(fi%, a$)  
2010 LOCAL i%, c%  
2020 FOR i% = 1 TO LEN(a$)  
2030 c% = ASC(MID$(a$, i%, 1))  
2040 BPUT #fi%, c%  
2050 NEXT  
2060 IF RIGHT$(a$, 1) <> CHR$13 THEN BPUT #fi%, 13  
2070 ENDPROC
```

This function may be used as follows:

```
My_File_Size% = FNsize("My_File")
```

Now the question is, can anyone adapt this to intelligently read the disc's catalogue and return the length of each file on it? £10 awaits the best solution!

Reading Wordwise

into Basic programs

THREE more useful utilities have come in from Mr Davies. The first is on reading *Wordwise* files into Basic programs. Now, BBC Basic stores string information in the form:

```
'00':string-length:sdrawkabgnirts:  
(ie:string backwards:)
```

Wordwise and other wordprocessing programs store strings as:

```
:string characters &OD:
```

In other words, a sequence of characters followed by carriage return. To read this into a Basic file requires the following simple function definition given as listing 5. The file to be read should be opened using fi% = OPENIN ("filename"). Strings may be read simply by the use of this function as in the simple program given in listing 6.

An obvious extension to the above function is a procedure that writes files that can be read by *Wordwise*. Such a procedure is given as listing 7. The file to be written to should be opened using fi% = OPENOUT ("filename").

◀ page 68

poking it back with ?&DFE=&97 <return>. To complete the change, push BREAK to reset page and to select the new default filing system.

To disable DFS. This requires bit 6 of &DFE to be set. Type:

```
?DFE = ?DFE OR &40 <return>
```

Alternatively, as above, you could add &40 to the contents of &DFE and type ?&DFE = &57 <return>. Push break as above.

To disable both NFS and DFS. Now both bits 6 and 7 must be set. Type:

```
?DFE = ?DFE OR &CO <return>
```

Alternatively, using the value obtained in &DFE + &CO type ?&DFE = &D7 <return>. Push break as above.

To restore the original setup, you merely have to restore the original value to &DFE. The 'nice' way is:

```
?&DFE = ?&DFE AND &3F <return>
```

Alternatively, using the example value from above, enter ?&DFE = &17. Finally push break to reselect the default filing system, and reset page.

Finally, two notes to augment the details provided in the second processor handbook, concerning the DNFS ROM. First, it states on page 47 (correctly) that the DFS has priority over the NFS - ie the computer will power up in DFS rather than NFS if left to its own devices. However, what is not mentioned is that you can use the left-hand one of the eight links on the front right of the keyboard to alter this. If this link is made, the priority is reversed. This can also be done to a lesser degree with an FX call, namely *FX 255,0,127 which will reverse the priority following the next break, and will remain in force until the next CTRL-BREAK. Alternatively *FX 255,128,127 will turn it back.

Second, on page 49, a list is given of the changes made to the Econet filing system. One omission, which we discovered the hard way at Oundle, is that the protocol for the broadcast facility, which allows eight-data bytes to be sent to *any* machine on the network, is implemented in a different manner. In version 3.34 (the first release version) the eight bytes received are transferred to the receive control block in the eight spaces normally used by pointers to the start and end of the receive buffer. In the DNFS (net version 3.60) this has been changed to the 'normal' receive procedure. Thus the eight bytes are transferred to a receive buffer pointed to by entries in the receive control block as described on page 77 of the Econet system guide. This is a fairly esoteric change, but it has forced us to accommodate both protocols!

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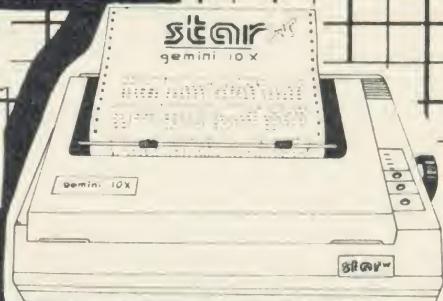
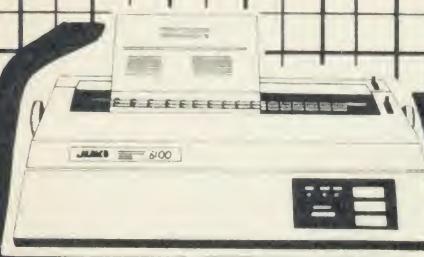
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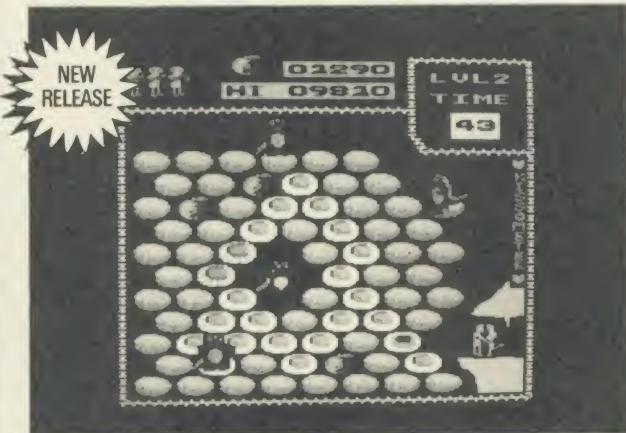
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Paul Beverley explains how the Beeb's random number generator works, and suggests a DIY system for greater randomness and speed



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RANDOM THOUGHTS

THE random number generator is our subject this month: how it works, whether it can be improved, and how to use it in machine code programs. Although random numbers are produced by software, the algorithm used, a 33-bit binary sequence generator, is based on an electronic circuit referred to as a 'ring-counter' or 'chain-code generator'.

Before we look at the software, let's see how the circuit works. Figure 1 shows a simple four-bit ring counter which consists of a shift register made up of four bistables which are basically one bit memory cells. Every time the register receives a clock pulse, each bit shifts one place to the right and the first bit (Q_0) takes on the value of the data input. This input is produced by feeding

back the outputs of two stages of the register through an exclusive -OR (EOR) gate.

This circuit consists of four bits, so there are 2^4 (ie, 16) possible combinations of outputs; but if the register is set to zero initially, the value will always stay at zero. This is because $0 \text{ EOR } 0 = 0$, which means the data input to the register is always zero. However, if you start with any other number, this ring counter will go in a particular sequence through all the remaining 15 possible combinations. The sequence produced depends on which of the lines are fed back, and only certain combinations of lines will give the maximum length sequence. In the case of a four-bit counter we have to use either Q_3 and Q_2 , or Q_3 and Q_0 . Using Q_3 with Q_1 will cause this counter to go into a loop consisting of fewer than the maximum 15 states.

With a longer shift register, certain lengths of register have no combination of two feedback lines that will produce the maximum possible cycle length of $(2^N - 1)$ states. In those cases, three feedback lines will still not produce the full cycle length, and four lines have to be used. Table 1 shows the numbers of lines needed for various lengths of register.

A very long ring-counter can be used as a means of generating a pseudo-random number. We call it 'pseudo-random' since it is not based on a truly random phenomenon, but provided you use a long enough cycle length it is adequate for most purposes. The generator used on the BBC micro consists of a 33-bit ring counter, which gives a cycle length of $2^{33} - 1$ which works out at 8,589,934,591! Before I discovered

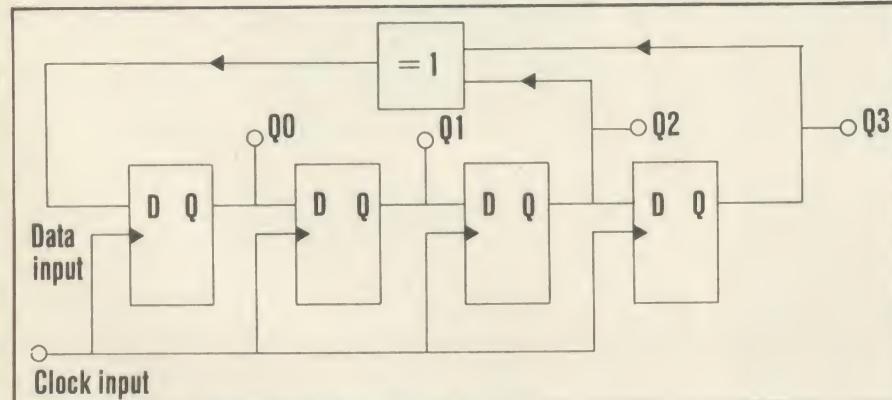


Figure 1. Circuit diagram of a 4-bit ring counter

AF87-	A0 20	LDY #&20	\ Count 32 shifts.
AF89-	A5 0F	LDA &0F	\ Move bit 3
AF8B-	4A	LSR A	\ of &0F into
AF8C-	4A	LSR A	\ LSB of the
AF8D-	4A	LSR A	\ accumulator.
AF8E-	45 11	EOR &11	\ EOR it with bit 33
AF90-	6A	ROR A	\ Put LSB into Carry flag.
AF91-	26 0D	ROL &0D	\ Shift along
AF93-	26 0E	ROL &0E	\ all four
AF95-	26 0F	ROL &0F	\ bytes, and
AF97-	26 10	ROL &10	\ finally the carry
AF99-	26 11	ROL &11	\ into LSB of &11.
AF9B-	88	DEY	\ Count down to zero.
AF9C-	D0 EB	BNE &AF89	\ Do it again.
AF9E-	60	RTS	

Figure 2. Section of machine code from the Basic II ROM - shifts the pseudo-random number generator 32 places. The same routine in Basic I starts at &AFB6

what the algorithm was, I wrote the fastest Basic program I could to see if I could find out when the sequence of numbers produced by the RND command repeated itself. I gave up after three days – a good job, for to find the repeat would have taken almost six months' continuous processing!

The reason for using 33 bits is that we need to produce four-byte random numbers but, as shown in table 1, the number of feedback lines needed for maximum cycle length on a 32-bit counter is four. Thus it is easier to use one bit of a fifth byte to make it up to 33 bits, and then you have only to exclusive-OR two lines.

Number of stages	Number of feedback lines
3	2
4	2
5	2
6	2
7	2
8	4
9	2
10	2
11	2
12	4
13	4
14	4
15	2
16	4
17	2
23	2
24	4
25	2
31	2
32	4
33	2

Table 1. The number of feedback lines needed to produce a maximum length cycle on an N bit ring counter

Figure 2 shows a disassembled listing of the code, and figure 3 shows it schematically. The comments on the listing and the diagram should explain what is going on. The idea is that it does 32 shifts each time a new random number is wanted. Then if you have asked for RND(1), Basic has to do further manipulation to make it into a floating point number between 0 and 1.

Set up before call	Code being timed	Time (μs)	Number range	Comments
- G% = &AF87:D% = &0D	R% = RND CALL G%:R% = !D%	1160 1700	-2^31/+2^31 -2^31/+2^31	Slower!
I% = 256 G% = &AF89: Y% = 8:D% = &0D G% = &AF87:D% = &0D	R% = RND(I%) CALL G%:R% = ?D%	3680 1130	1-256 0-255	8 bit shift
I% = 8 I% = 7	CALL G%:R% = ?D%	1680	0-255	32 bit shift
- H% = &7FFFFFFF G% = &AF87:D% = &0D	R = RND(1) CALL G%:R = !D%/H%	1560 3830	0-1 0-1	Slower!

Table 2. Timings of various random number generator calls (calls for BASIC I are &AFB6 and &AFB8)

For RND(N%), where N% > 1, it takes a number between 0 and 1, multiplies it by N% and rounds it up to the nearest whole number to give a number between 1 and N%.

As you can see from table 2, it takes between just over a millisecond (ms) and about 3.6ms to produce these numbers. This may not seem a long time, but for some simulations or machine code games it would be good to have some means of speeding things up. There are three possible approaches; the first is to try to speed up the use of the generator in the Basic ROM, the second is to write a faster simulation, and the third, for the fastest speed, is to make up the generator in the form of an electronic circuit, and read it using some sort of interface.

Even when working in Basic it is possible to speed things up in certain cases, as shown in table 2. If you need a four-byte number as produced by RND then it is no quicker to CALL the routine, but if you want only a single-byte random number it is an advantage to CALL the routine. The results show that RND(256) is much slower than CALLing the routine and picking off the byte using byte indirection, even if you shift it by 32 bits instead of eight.

The other way to improve the speed

is to use a number range which is a power of two. This is done by using RND and doing a logical AND on it with 3, 7, 15, 31, 63, etc. This effectively picks off a number of bits from the bottom of the four-byte number. You have to remember, though, that RND AND 7, for example, produces a number between 0 and 7, and the nearest equivalent is RND(8), which produces a number between 1 and 8.

When writing machine code programs, it is possible to use the random number generator in the Basic ROM, provided of course you don't want to put your code in sideways ROM. Even so, it is simplicity itself to copy the code shown in figure 2 into your own program.

For example, all you have to do if you want an eight-bit random number is to shift the generator eight times and read off one of the bytes.

Thus:

```
LDY #8
JSR &AFB8 (or &AF89 for Basic II)
LDA &OD
```

would return the random number in the accumulator.

When it comes to writing a new random number routine, the problem is that reducing the length of the counter

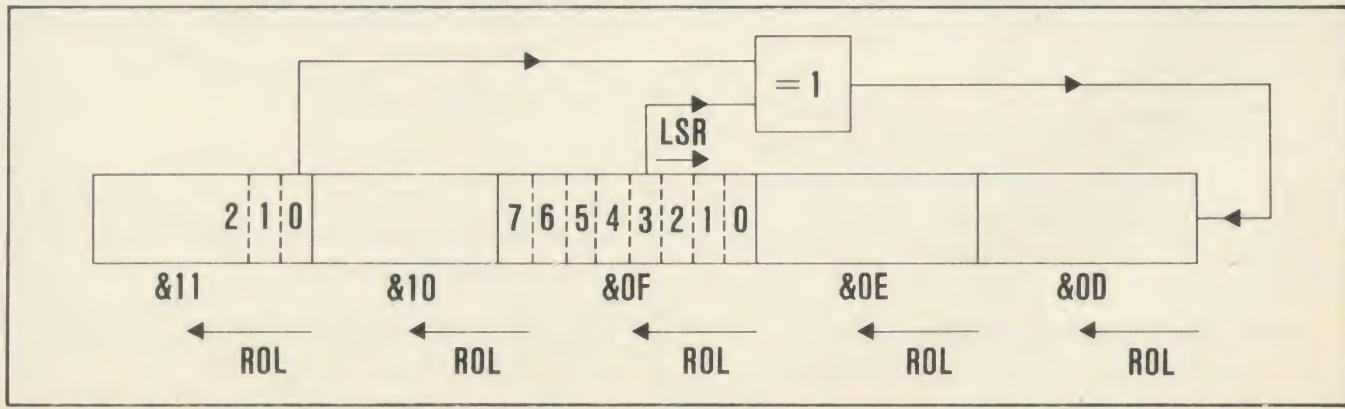


Figure 3. The 33-bit ring counter simulated by program 1

shortens the cycle time and therefore reduces the randomness. The technique I have used is to shorten the length to two bytes and use only 15 of the 16 bits for feedback purposes to simplify the exclusive-OR process (table 1). To regain some of the lost randomness I have used an interrupt routine which increments a counter. While shifting the two bytes, this counter is exclusive-ORed with the other feedback lines.

All this is illustrated in program 1 (yellow page ix). This includes two methods of testing the randomness of the generator and also allows you to apply the tests to the existing generator for comparison. The first test is a bitmap which puts dots on the screen whose co-ordinates are selected by the generator. This will soon reveal any patterns in the cycling. The second is a frequency graph or histogram which plots a graph of the number of times (Y-axis) each of the numbers 0 to 255 (X-axis) are selected.

I am not convinced as to how effective these routines are at testing the

randomness of the generators, but I have tried in vain to find a better way. The impressive looking equations in learned papers about random number generators were totally incomprehensible to me. Is there a statistician out there who knows how to test random number generators?

Nevertheless, the results of these tests seem to show that the new generator gives roughly the same degree of randomness as the original one, even though it takes only 14.5 microseconds (μs) per shift (116 μs per eight-bit number) compared with the 22 μs per shift (176 μs per eight-bit number) that the Basic generator takes. The new generator, however, needs an interrupt routine as well which will slow down the overall speed of the program slightly. However, the routine adds only 4 μs to each interrupt routine, and interrupts occur only every 5ms, so that is less than 0.1% reduction in speed.

The parts of the program relating to producing the new random number are line 720, which picks up the present value of the interrupt vector, lines 850

and 860, which make up the interrupt routine, lines 900-960, which change the interrupt vector, lines 1000-1060, which restore the original interrupt vector to disable our additional routine, and lines 1160-1250, which contain the shifting algorithm itself.

Now for a challenge. If you want to write your own random number routine, you can put it in place of the 'newRND' routine and test it out. If it either shows better randomness on each of the two tests than either of the routines given, or it's faster than 14.5 μs per shift, let us know, and we'll publish it. However, if you really want a good-quality, high speed random number generator you'll have to wait for next month.

Next month A random number generator made from components costing less than £4 which attaches to the user port. It can produce eight-bit numbers at a maximum rate of one every 20 μs , and reading the number takes only 6 μs , which gives you 14 μs to do something with it before the next one is ready.

PUBLISHER'S ANNOUNCEMENT

ACORN USER SUBSCRIPTIONS

We apologise to readers who have suffered a disruption following the change of publisher.

All records have now been transferred to a new computer system, but there is still a backlog of renewals and queries from people quoting the old subscriber numbers.

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Do not write in about the same problem twice – please be patient, you should still find that your copies arrive.

ACORN USER PAPER QUALITY

A combination of exceptional demand from the USA and industrial action affecting paper mills has caused a severe shortage of the coated paper on which we usually print *Acorn User*. As a result, the cost of this paper has risen by 30% in ten months.

As most readers would prefer us to keep the cover and subscription price at current levels, we have switched the non-colour sections of *Acorn User* to the sort of paper used in the magazine supplements of Sunday newspapers.

We hope this will not interfere with your enjoyment of the content which, of course, we continually strive to improve. Issue sizes have doubled since last year, with no increase in cover price, so we are sure you will find *Acorn User* still delivers great value for money.

16 PAGES OF FUN AND LEARNING

THE 16 yellow pages in this section contain all the major programs in this issue. We've separated the listings from the articles to make them easier for you to type in and find—or even cut out and keep separately under topics such as graphics, sound, utilities, etc.

First Byte: 'Sounds inviting' (page 47)	i
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First Byte: 'How to correct program listings' (page 37)	iii-vi
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Education: 'Teaching toddlers'	xi
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Atom: 'Avoiding errors ...'	xvi

I

See 'Sounds inviting', page 47

```

10 REM *** ON THE LAKE ***
20 REM **(c) Acorn User **
30 MODE 6
40 VDU19,0,4;0;
50 PRINT' '''''
60 PRINT SPC(10)" ON THE LAKE"
70 PRINT' ''''SPC(9)"(c) Acorn User"
80 O=0
90 D=0
100 D=D+1
110 RESTORE 220
120 FOR N=1 TO 44
130 READ A, B, C
140 SOUND 1,-15,A+0,C
141 SOUND 2,-15,B+0,C
150 NEXT N
160 ON D GOTO170,180,190,210,210
170 O=-24 : GOTO100
180 O=0 : GOTO100
190 O=-12 : GOTO100
200 O=-24 : GOTO100
210 END
220 DATA165,101,1,169,101,1,165,101,1,
221 177,97,5,177,89,5,177,81,5,165,101,5,157
222 ,101,5,149,101,5,177,97,5,177,89,5,177,8
223 1,5,165,101,5,157,101,5,149,101,5
224 230 DATA169,109,5,165,109,5,169,101,5,
225 177,97,5,169,97,5,165,101,5,157,81,5,157
226 ,89,5,97,97,5,165,101,5,157,101,5,149,10
227 1,5,177,97,5,177,89,5,177,81,5
228 240 DATA165,101,5,157,101,5,149,101,5,
229 177,97,5,177,89,5,177,81,5,165,101,5,169
230 ,101,5,165,101,5,157,89,5,165,89,5,157,8
231 9,5
250 DATA149,101,15,149,101,10

```

```

10 REM ***** RIDING *****
20 REM ** (C) Acorn User **
30 MODE 6
40 VDU19,0,4;0;
50 PRINT' '''''
60 PRINT SPC(7)"A TUNE CALLED RIDING"
70 PRINT' ''''SPC(9)"(c) Acorn User"
80 O=24
90 FOR NNN=1 TO 2
100 FOR NN=1 TO 2
110 RESTORE 210
120 FOR N=1 TO 42
130 READ A, B, C
140 SOUND1,-15,A-0,C*8
150 SOUND2,-15,B-0,C*8
160 NEXT N
170 O=0-12
180 NEXT NN
190 O=24
200 NEXT NNN
210 DATA165,101,1,169,101,1,165,101,1,
211 177,117,1,169,117,1,165,117,1,157,129,1,
212 165,129,1,157,129,1,169,129,1,165,129,1,
213 157,129,1,149,117,1,157,117,1,149,117,1
220 DATA165,101,1,157,101,1,149,101,1,
221 157,129,3,157,121,3,165,117,1,169,117,1,
222 165,117,1,177,101,1,169,101,1,165,101,1,
223 157,121,1,165,121,1,157,121,1
230 DATA169,109,1,165,109,1,157,109,1,
231 165,129,1,169,129,1,165,129,1,157,121,1,
232 165,121,1,157,121,1,149,117,1,149,129,1,
233 149,117,1,149,101,3

```

Listing 2

Listing 1

SPECIAL MONTHLY LISTINGS CASSETTE

FOR readers who have trouble typing in listings, or just don't have the time and patience, ACORN USER has made a special cassette

available containing all the major programs in this issue. It costs just £3.75, which includes postage and packing. Turn to page 81, which is

immediately after this yellow pages section, for details. The order form is at the bottom of page 82.

See pages 65 and 70

- Listing 3. Printer toggler interrupt routine by C Binstead**

PTRTGLR - PRINTER TOGGLER INTERRUPT ROUTINE

```

1 REM          PTRTGLR - PRINTER TOGGLER INTERRUPT ROUTINE
2 REM
3
4 FOR I%=0 TO 2 STEP 2
5 P%=&A00
6 LDA I%
7 PHP : PHA : TXA : PHA : TYA : PHA      /Save Registers
8 LDA #126 : LDX #0 : JSR &FFF4        /Acknowledge ESCAPE pressed
9 LDA&70 : CMP#0                         /Check 'Toggle' byte
10 BNE PTROFF                          /If 1 turn printer off
11 .PTRON : LDA#2 : JSR &FFEE           /VDU 2 - Turn printer on
12 LDA#1 : STA&70                         /Invert 'Toggle' byte
13 JMP PIF                            /Interrupt finished
14 .PTROFF : LDA#3 : JSR &FFEE           /VDU 3 - Turn printer off
15 LDA#0 : STA&70                         /Invert 'Toggle' byte
16 LDA#1 : JSR &FFEE : LDA#13 : JSR &FFEE   /VDU 1,13 - Send CR to printer
17 LDA#1 : JSR &FFEE : LDA#13 : JSR &FFEE   /VDU 1,13 - Send CR to printer
18 .PIF
19 PLA : TAY : PLA : TAX : PLA : PLP      /Restore registers
20 RTS:]      REM                         Return from interrupt routine
21 NEXT I%
22 ?&220=&0 : REM
23 ?&221=&A : REM
24 ?&70=0 : REM
25 *FX14,6 : REM

```

Low byte of interrupt address
 High byte of interrupt address
 Start condition 'Printer off-on'
 Enable 'ESCAPE PRESSED' event

- Listing 4.** Function to return the filesize, by Mr Davies of Horley

```
● 3000 DEF FNsize(filename$)
● 3010 REM
● 3020 REM ** Define osfile.
● 3030 LOCAL osfile: osfile= &FFDD
● 3040 REM
● 3050 REM ** Set up osfile workspace in zero page.
● 3060 LOCAL m%: m%= &70: m%!&A= 0
● 3070 REM
● 3080 REM ** Store filename$ in a temporary memory area.
● 3090 LOCAL n%: n%= &100: $n%= filename$
● 3100 REM
● 3110 REM ** Point osfile workspace to filename$
● 3120 m%?0=n% MOD &100: m%?1=n% DIV &100
● 3130 REM
● 3140 REM ** Now set X% and Y% to point to workspace
● 3150 REM ** and set A% to 5. This requests the files
● 3160 REM ** attributes from the disc catalogue.
● 3170 X%=m%: Y%=m% DIV &100: A%=5: CALL osfile
● 3180 REM
● 3190 REM ** Finally, extract the size from the workspace.
● 3180 =m%!&A
```

See 'How to correct listings', page 37

```

● 10 REM listing 1
● 20 REM Uncorrected version
● 30 MODE 1
● 40 PROCinitialise
● 50 PROClock
● 60 ON ERROR GOTO 80
● 70 PROCrn
● 80 REPEAT
● 90 PROCINPUT
● 100 UNTIL0
● 110 END
● 120 :
● 130 DEFPOCinitialise
● 140 *FX111,0
● 150 @=0
● 160 DIM B(1),hex$(15),oldB1)
● 170 VDU 23;8202;0;0;0
● 180 VDU 19,0,4,0,0
● 190 VDU 19,2,0,0,0
● 200 VDU 24,0,352;1279;1023;
● 210 FOR N=0 TO 15
● 220 hex$(n)=CHR$(
●   (N-48*(N<10)-55*(N>9)))
● 230 NEXT N
● 240 GCOL0,129
● 250 CLG
● 260 VDU,28,0,31,39,21
● 270 END
● 280 :
● 290 DEFPROClocks
● 300 VDUS
● 310 GCOL0,2
● 320 MOVE320,110
● 330 PRINT"Hexadecimal numbers
● 340 rad=250
● 350 FOR N=0 TO 1
● 360 FOR T=0 TO 51
● 370 VDU29,(300+600*N);700;
● 380 MOVE(rad*SIN(T*PI/8)),
●   (rad*COS(T*PI/8))
● 390 PRINT hex$(T)
● 400 NEXT N
● 410 NEXT T
● 420 GCOL0,3
● 430 rad=280
● 440 FOR N = 0 TO 1
● 450 VDU29,(312+600*N);685;
● 460 MOVE0,rad
● 470 FOR T=0 TO 2*PI STEP PI/12
● 480 DRAW(rad*SIN(T)),(rad*COS(T))
● 490 NEXT T
● 500 NEXT N
● 510 VDU4
● 520 ENDPROC
● 530 ;
● 540 PROCrn
● 550 FOR T=1 TO 255
● 560 PROCdisplay(t)
● 570 NEXT T
● 580 ENDPROC
● 590 :
● 600 DEFPROCdisplay(number)
● 610 oldb(0)=B(0)
● 620 oldB(1)=B(1)
● 630 B(0)=number MOD 16
● 640 B(1)=number DIV 16
● 650 FOR N=0 TO 1
● 660 PROCincrement(7,oldB(N)
● 670 PROCincrement(5 B(N))
● 680 NEXT N
● 690 PROCprint
● 700 X-GET
● 710 ENDPROC
● 720 :
● 730 DEFPROCprint
● 740 CLS
● 750 COLOUR 2
● 760 PRINTTAB(1,2)";hex(B(1));"0";
● 770 COLOUR 3
● 780 PRINT = 16 x "B(1)" = ";
● 790 COLOUR 1
● 800 PRIN T(1)*16
● 810 COLOUR 2
● 820 PRINTTAB(25,2)";hex$(B(0));
● 830 COLOUR 3
● 840 PRINT" =
● 850 COLOUR 1
● 860 PRINT B(0)
● 870 COLOUR 2
● 880 PRINTTAB(9,9)";"
●   hex$(B(1)),hex$(B(0));
● 890 COLOUR
● 900 PRINT" =
● 910 COLOUR1
● 920 PRINTnumber
● 930 COLOUR 2
● 940 PRINT" in BASE 10"
● 950 PRINTTAB(12,9)"Press spice bar"
● 960 ENDPROC
● 970 :
● 980 DEFPROCincrement(Z,value)
● 990 VDU29,(918-600*N);685
● 1000 rad=200
● 1010 ang=value*PI/8
● 1020 MOVE0,0
● 1030 PLOT Z,rad*SIN(angle),rad:COS(angle)
● 1040 ENDPROC
● 1050 :
● 1060 DEFPROCinput
● 1070 repeat
● 1080 CLG
● 1090 INPUTTAB(5,5)"Enter a number
●   in base 10 "number
● 1100 UNTIL (number% > =1)
●   AND (number% < 256)
● 1110 PROCdisplay(number%)
● 1120 ENDPROC

```



See 'How to correct listings', page 37

IV

```

●
● 10 REM listing 2
● 20 REM Correct version
● 30 MODE 1
● 40 PROCinitialise
● 50 PROCclocks
● 60 ON ERROR GOTO 80
● 70 PROCrun
● 80 REPEAT
● 90 PROCinput
● 100 UNTIL0
● 110 END
● 120 :
● 130 DEFPROCinitialise
● 140 *FX11,0
● 150 @%-0
● 160 DIM B(1),hex$(15),oldB(1)
● 170 VDU 23;8202;0;0;0;
● 180 VDU 19,0,4,0,0,0
● 190 VDU 19,2,0,0,0,0
● 200 VDU 24,0;352;1279;1023;
● 210 FOR N=0 TO 15
● 220 hex$(N)=CHR$(
●      (N-48*(N<10)-55*(N>9)))
● 230 NEXT N
● 240 GCOL0,129
● 250 CLG
● 260 VDU 28,0,31,39,21
● 270 ENDPROC
● 280 :
● 290 DEFPROCclocks
● 300 VDU5
● 310 GCOL0,2
● 320 MOVE320,1010
● 330 PRINT"Hexadecimal numbers"
● 340 rad=250
● 350 FOR N=0 TO 1
● 360 FOR T=0 TO 15
● 370 VDU29,(300+600*N);700;
● 380 MOVE(rad*SIN(T*PI/8)),
●      (rad*COS(T*PI/8))
● 390 PRINT hex$(T)
● 400 NEXT T
● 410 NEXT N
● 420 GCOL0,3
● 430 rad=280
● 440 FOR N = 0 TO 1
● 450 VDU29,(312+600*N);685;
● 460 MOVE0,rad
● 470 FOR T=0 TO 2*PI STEP PI/12
● 480 DRAW(rad*SIN(T)),(rad*COS(T))
● 490 NEXT T
● 500 NEXT N
● 510 VDU4
● 520 ENDPROC
● 530 :
● 540 DEFPROCrun
● 550 FOR T=1 TO 255
● 560 PROCdisplay(T)
● 570 NEXT T
● 580 ENDPROC
● 590 :
● 600 DEFPROCdisplay(number)
● 610 oldB(0)=B(0)
●
● 620 oldB(1)=B(1)
● 630 B(0)=number MOD 16
● 640 B(1)=number DIV 16
● 650 FOR N=0 TO 1
● 660 PROCincrement(7,oldB(N))
● 670 PROCincrement(5,B(N))
● 680 NEXT N
● 690 PROCprint
● 700 X=GET
● 710 ENDPROC
● 720 :
● 730 DEFPROCprint
● 740 CLS
● 750 COLOUR 2
● 760 PRINTTAB(1,2)";hex$(B(1));"0";
● 770 COLOUR 3
● 780 PRINT" = 16 x "B(1)" = ";
● 790 COLOUR 1
● 800 PRINTB(1)*16
● 810 COLOUR 2
● 820 PRINTTAB(25,2)";hex$(B(0));
● 830 COLOUR 3
● 840 PRINT" = ";
● 850 COLOUR 1
● 860 PRINT B(0)
● 870 COLOUR 2
● 880 PRINTTAB(9,6)";hex$(B(1)),hex$(B(0));
● 890 COLOUR 3
● 900 PRINT" = ";
● 910 COLOUR1
● 920 PRINTnumber;
● 930 COLOUR3
● 940 PRINT" in BASE 10"
● 950 PRINTTAB(12,9)"Press space bar"
● 960 ENDPROC
● 970 :
● 980 DEFPROCincrement(Z,value)
● 990 VDU29,(918-600*N);685;
● 1000 rad=200
● 1010 angle=value*PI/8
● 1020 MOVE0,0
● 1030 PLOT Z,rad*SIN(angle),rad*COS(angle)
● 1040 ENDPROC
● 1050 :
● 1060 DEFPROCinput
● 1070 REPEAT
● 1080 CLS
● 1090 INPUTTAB(5,5)"Enter a number in
●      base 10 "number%
● 1100 UNTIL (number% > -1) AND (number% < 256)
● 1110 PROCdisplay(number%)
● 1120 ENDPROC

```



See 'How to correct listings', page 37

```

10 REM Listing 3
20 REM Uncorrected Version
30 MODE 1
40 PROCINITIALISE
50 PROCLOCK
60 ON ERROR GOTO 80
70 PROCRUN
80 REPEAT
90 PROCINPUT
300 VDUS
290 DEFPROC1DCS
280 :
270 END
440 *F111,0
140 *F111,0
150 E=0
160 DIM B(1),HEX$(15),OIDB1
170 VDU 23;B202;0;0;0
180 VDU 19,0,4,0,0
190 VDU 19,2,0,0,0
200 VDU 24,0,352;1279;1023;
210 FOR N=0 TO 15
220 HEX$(N)=CHR$(N-48*(N<10)-55*(N>9))
230 NEXT N
240 GCOL0,129
250 CLG
260 VDU,28,0,31,39,21
500 NEXT N
510 VDU4
520 ENDPROC
530 :
540 PROCRUN
550 FOR T=1 TO 255
560 PROCDISPLAY(T)
570 NEXT T
580 ENDPROC
590 :
600 DEFPROCDISPLAY(Number)
610 OIDB(0)=B(0)
620 OIDB(1)=B(1)
630 B(0)=Number MOD 16
640 B(1)=Number DIV 16
650 FOR N=0 TO 1
660 PROCINCRMENT(7,OIDB(N))
670 PROCINCRMENT(5,B(N))
200 MOVE0,rad
460 MOVE0,rad
470 FOR T=0 TO 2*PI STEP PI/12
480 DRAW(RAD*SIN(T)),(RAD*COS(T))
490 NEXT T
500 NEXT N
510 VDU4
520 ENDPROC
530 :
540 PROCRUN
550 FOR T=1 TO 255
560 PROCDISPLAY(T)
570 NEXT T
580 ENDPROC
590 :
600 MOVE0,rad
440 FOR N = 0 TO 1
450 VDU29,(312+600*N)685;
460 GCOL0,3
470 GCOL0,3
480 GCOL0,3
490 NEXT T
500 NEXT N
510 VDU4
520 ENDPROC
530 PRINT "Hexadecimal numbers
540 RAD=250
550 FOR N=0 TO 1
560 FOR T=0 TO 51
570 VDU29,(300+600*N);700;
580 MOVE (RAD*SIN(T*PI/8))
590 MOVE (RAD*COS(T*PI/8))
370 VDU29,(300+600*N);700;
380 MOVE (RAD*SIN(T*PI/8))
390 PRINT HEX$(T)
400 NEXT N
410 NEXT T
420 GCOL0,3
430 RAD=280
440 RAD=280
450 VDU29,(312+600*N)685;
460 GCOL0,3
470 GCOL0,3
480 GCOL0,3
490 NEXT T
500 NEXT N
510 VDU4
520 ENDPROC
530 PRINT "Hexadecimal numbers
540 RAD=250
550 FOR N=0 TO 1
560 FOR T=0 TO 51
570 VDU29,(300+600*N);700;
580 MOVE320,110
590 GCOL0,2
310 GCOL0,2
320 MOVE320,110
330 PRINT "Hexadecimal numbers
340 RAD=250
350 FOR N=0 TO 1
360 FOR T=0 TO 51
370 VDU29,(300+600*N);700;
380 MOVE (RAD*SIN(T*PI/8))
390 MOVE (RAD*COS(T*PI/8))
400 PRINT HEX$(T)
410 NEXT N
420 GCOL0,3
430 RAD=280
440 RAD=280
450 VDU29,(312+600*N)685;
460 GCOL0,3
470 GCOL0,3
480 GCOL0,3
490 NEXT T
500 NEXT N
510 VDU4
520 ENDPROC
530 PRINT "Hexadecimal numbers
540 RAD=250
550 FOR N=0 TO 1
560 FOR T=0 TO 51
570 VDU29,(300+600*N);700;
580 MOVE (RAD*SIN(T*PI/8))
590 MOVE (RAD*COS(T*PI/8))
220 HEX$(N)=CHR$(N-48*(N<10)-55*(N>9))
230 NEXT N
240 GCOL0,129
250 CLG
260 VDU,28,0,31,39,21
500 NEXT N
510 VDU4
520 ENDPROC
530 :
540 PROCRUN
550 FOR T=1 TO 255
560 PROCDISPLAY(T)
570 NEXT T
580 ENDPROC
590 :
600 DEFPROCDISPLAY(Number)
610 OIDB(0)=B(0)
620 OIDB(1)=B(1)
630 B(0)=Number MOD 16
640 B(1)=Number DIV 16
650 FOR N=0 TO 1
660 PROCINCRMENT(7,OIDB(N))
670 PROCINCRMENT(5,B(N))

```

```

680 NEXT N
690 PROCd$Prlnt
700 X-GET
710 ENDPROC
720 :
730 DEFPROCpInit
740 CLS
750 COLOUR R2
760 PRINTTAB(1,2) ;"x";hex(B(1));"0";
770 COLOUR 3
780 PRINT = 16 * "B(1)" = "x";
790 COLOUR 1
800 PRIN T(1)*16
810 COLOUR 2
820 PRINTTAB(25,2) ;"x";hex(B(0));
830 COLOUR 3
840 PRINT" = "
850 COLOUR 1
860 PRINT B(0)
870 COLOUR 2
880 PRINTTAB(9,9) ;"x";hex(B(1)),hex(B(0));
890 COLOUR R
900 PRINT" = ";
910 COLOUR1
920 PRINTNUMBER
930 COLOUR R2
940 PRINT" in BASE 10"
950 PRINTTAB(12,9) ;"Press splice bar"
960 ENDPROC
970 :
980 DEFPROCinCrement(Z,value)
990 VDU29, (918-600*N);685
970 :
980 DEFPROCinCrement(Z,value)
990 VDU29, (918-600*N);685
1000 rad=200
1010 ang=valu*pi/8
1020 MOVE0,0
1030 PLOT Z,rad*sin(angle),rad:cos(angle)
1040 ENDPROC
1050 :
1060 DEFPROCinPut
1070 REPEAT
1080 CLG
1100 UNTIL (number% > =1) AND (number% < 256
1110 PROCd$Prlay(number%)
1120 ENDPROC

```

See 'Beeb Forum', page 65

```

● A6 F4    LDX  &F4      \ save old rom id
● B4 F4    STY  &F4      \ insert new rom id
● BC 30 FE STY  &FE30   \ switch to new rom
● A0 00    LDY  £00      \ use indirect indexed addressing
● B1 F6    LDA  (&F6),Y  \ to read byte pointed to by &F6,&F7
● B6 F4    STX  &F4      \ restore old rom id
● BE 30 FE STX  &FE30   \ switch back to old rom
● 60      RTS          \ return
●

```

Figure 1. Routine called from OS ROM

460 FOR Z%=0 TO 18

and line 510:-

510 DATA &A6,&F4,&84,&F4,&BC,&30,&FE,&A0,&00,&B1,&F6,&86,&F4,&8E,&30,&FE,&85,&F6,&60

VII

Figure 2. Changes to program 1 if OS routine inserted

```

● 0 REM ROM-DUMP (C) R.Newman, Dundle School, May 1984
● 10 DIM buf%15,b1k%4
● 20 osbyte=&FFF4:osword=&FFF1
● 30 MODE3
● 40 PRINTTAB(30,1)"ROM-DUMP"
● 50 INPUTTAB(25,3)"Which ROM? (12-15) "R%
● 60 IF R%>12 OR R%>15 THEN PRINTTAB(44,3);SPC(10):GOT050
● 70 PRINT'
● 80 AT%=&0%:&0%=&00020003:REM adjust print field
● 90 PROCover:REM "poke" code to IO memory
● 100 PROCwrite(&80,&F7):REM &F6,&F7 points to page &8000
● 110 PROCwrite(0,&200):REM point USERV (&200,&201) to code at &2200
● 120 PROCwrite(&22,&201)
● 130 FOR Z%=0 TO 255 STEP 16
● 140 PRINT~(&8000+Z%);" - ";
● 150 FOR J%=0 TO 15
● 160 PROCwrite(Z%+J%,&F6):REM set low byte of &F6,&F7 pointer
● 170 PROCstarcode:REM call USERV code to get ROM byte
● 180 buf%?J%=?FNread(&F6):PRINT~buf%?J%:;
●     REM transfer ROM byte & print it
● 190 NEXTJ%
● 200 PRINT" : ";
● 210 FOR J%=0 TO 15:REM print ascii interpretation
● 220 IF buf%?J%<32 OR buf%?J%>127 THEN PRINT".";
●     ELSE PRINTCHR$(buf%?J%);
● 230 NEXTJ%
● 240 PRINT
● 250 NEXTZ%
● 260 @%=&AT%:REM reset print field
● 270 END
● 280 DEF PROCwrite(data,addr)
● 290 LOCAL A%,X%,Y%
● 300 'b1k%=&addr:b1k%?4=data
● 310 A%=6:X%=b1k%:Y%=X% DIV256
● 320 CALL osword
● 330 ENDPROC
● 340 DEF FNread(addr)
● 350 LOCAL A%,X%,Y%
● 360 'b1k%=&addr
● 370 A%=5:X%=b1k%:Y%=X% DIV256
● 380 CALL osword
● 390 =b1k%?4
● 400 DEF PROCstarcode
● 410 LOCAL A%,X%,Y%
● 420 A%=136:X%=0:Y%=R%:CALL osbyte
● 430 ENDPROC
● 440 DEF PROCover
● 450 LOCAL Z%
● 460 FOR Z%=0TO5
● 470 READ data
● 480 PROCwrite(data,&2200+Z%)
● 490 NEXT
● 500 ENDPROC
● 510 DATA &20,&B9,&FF,&85,&F6,&60 : REM JSR &FFB9: STA &F6: RTS
●

```

Program 1. Displays the first page sideways ROM on a standard BBC micro

See 'New chip with Tube' on page 68

Code from DNFS ROM to illustrate software disable flags

80F7-	2C 8F 02	BIT	&02BF	\Service entry
80FA-	08	PHP		\Test keyboard links
80FB-	10 03	BPL	&B100	\Branch if NFS has priority
80FD-	20 9D 9F	JSR	&9F9D	\Disk service calls
8100-	4B	PHA		
8101-	C9 01	CMP	E&01	\NFS service call 1
8103-	D0 15	BNE	&B11A	
8105-	AD A0 FE	LDA	&FEAO	\Check 68B54 Status Reg. 1
8108-	29 ED	AND	E&ED	
810A-	D0 07	BNE	&B113	\Branch if check fails
810C-	AD A1 FE	LDA	&FEA1	\Check 68B54 Status reg. 2
810F-	29 DB	AND	E&DB	
8111-	F0 07	BED	&B11A	\Branch if check is OK
8113-	3E F0 0D	ROL	&0DF0,X	\Set ignore NFS flag
8116-	3B	SEC		\by shifting msb to carry
8117-	7E F0 0D	ROR	&0DF0,X	\setting it and shifting back
811A-	BD F0 0D	LDA	&0DF0,X	
811D-	0A	ASL		\Get ignore flag bit
811E-	6B	PLA		
811F-	30 02	BMI	&8123	\A holds Tube service code so branch
8121-	B0 6E	BCS	&8191	\Branch if ignore flag set
8123-	C9 FE	CMP	E&FE	
8125-	90 5C	BCC	&81B3	
8127-	D0 1B	BNE	&B144	\If not eq. A=&FF (tube init. call)
8129-	C0 00	CPY	E&00	
812B-	F0 56	BED	&81B3	
812D-	A2 06	LDX	E&06	\Tube present, so
812F-	A9 14	LDA	E&14	\explode character set (*FX20,6)
8131-	20 F4 FF	JSR	&FFF4	
8134-	2C E0 FE	BIT	&FEE0	
8137-	10 FB	BPL	&8134	
8139-	AD E1 FE	LDA	&FEE1	
813C-	F0 43	BED	&81B1	
813E-	20 EE FF	JSR	&FFEE	
8141-	4C 34 B1	JMP	&8134	
8144-	A9 AD	LDA	E&AD	\Set up tube code in I/O processor
8146-	BD 20 02	STA	&0220	
8149-	A9 06	LDA	E&06	
814B-	BD 21 00	STA	&0221	
814E-	A9 16	LDA	E&16	
8150-	BD 02 02	STA	&0202	
8153-	A9 00	LDA	E&00	
8155-	BD 03 02	STA	&0203	
....				
....				
.... \code continues				
....				
....				
8191-	B0 1C	BCS	&81AF	\Branch again!
....				
.... \code continues				
....				
....				
81AF-	28	PLP		\Restore info from keyboard links
81B0-	30 37	BMI	&81E9	\Branch to RTS if Disk had priority
81B2-	4C 9D 9F	JMP	&9F9D	\Jump to disk service calls
....				
....				
....				
9F9D-	4C 74 B4	JMP	&B494	
....				
....				
....				
8494-	4B	PHA		\Disk service calls
8495-	AD B0 FE	LDA	&FE80	\Check for presence of 8271 chip
8498-	29 03	AND	E&03	\check bits 0,1 of status reg.
849A-	D0 4D	BNE	&B4E9	\If not 0 branch and skip disk calls
849C-	BD F0 0D	LDA	&0DF0,X	\Check DFS ignore flag (bit 6) by
849F-	0A	ASL		\shifting left and seeing if "new"
84A0-	30 47	BMI	&B4E9	\bit 7 is set. If so branch.
....				
....				
\Disk service calls in here				
....				
....				
B4E9-	6B	PLA		\Branch to here
B4EA-	60	RTS		

The above code is copyright (C) Acorn Computers.

See 'Random numbers', page 78

IX

```

● 10 PROCinitialise
● 20 MODE 0
● 30 REPEAT
● 40 PROCmenu
● 50 UNTIL INKEY(0) >0
● 60 END
● 70
● 80 DEF PROCmenu
● 90 REM *****
● 100 CLS
● 110 PRINT"Old or new generator? (0 or 1)"
● 120 INPUT"(-1 to END). Your choice", new
● 130 IF new = -1 THEN END
● 140 IF new rndGEN = newRND ELSE rndGEN = basRND
● 150 PROCassemble_tests
● 160 IF new CALL int_on
● 170 INPUT"Histogram or map? (0 or 1)", map
● 180 IF map PROCdrawmap ELSE PROChist
● 190 ENDPROC
● 200
● 210 DEF PROCdrawmap
● 220 REM *****
● 230 CLS
● 240 PRINT TAB(65); " ";
● 250 IF new PRINT"NEW"; ELSE PRINT"BASIC";
● 260 CALL RNDmap
● 270 CALL int_off
● 280 ENDPROC
● 290
● 300 DEF PROChist
● 310 REM *****
● 320 INPUT"How many sets of values", A%
● 330 Q% = A%
● 340 FOR M% = 0TO255
● 350 N%(M%) = 0
● 360 NEXT
● 370 REPEAT
● 380 CALL RNDhist
● 390 max% = 0:min% = &FFFF:tot% = 0
● 400 FOR M% = 0TO255
● 410 N%(M%) = N%(M%)+?(B%+M%)+?(C%+M%)*256
● 420 tot% = tot%+N%(M%)
● 430 IF N%(M%)>max% max% = N%(M%)
● 440 IF N%(M%)<min% min% = N%(M%)
● 450 NEXT
● 460 CLS
● 470 PRINT"max ";max%;" min ";min%;
● 480 PRINT" ave ";tot%/256;" ";
● 490 R% = (max%-min%)/tot%*12800
● 500 PRINT" range +/- ";R%;"%" ;
● 510 IF new PRINT"NEW" ELSE PRINT"BASIC"
● 520 MOVE 0,N%(0)*4/Q%
● 530 FOR M% = 1TO255
● 540 DRAWM%*4,N%(M%)*4/Q%
● 550 NEXT
● 560 Q% = Q%+A%
● 570 UNTIL INKEY(0)>0
● 580 CALL int_off
● 590 ENDPROC
● 600
● 610 DEF PROCeerr_handle
● 620 REM *****
● 630 CALL int_off
● 640 REPORT
● 650 PRINT" at "ERL
● 660 ENDPROC
● 670
● 680 DEF PROCinitialise
● 690 REM *****
● 700 DIM B% 256, C% 256, N%(255)
● 710 ON ERROR PROCeerr_handle:END
● 720 oldIRQ = !&204 AND &FFFF
● 730 bas = &AFB9
● 740 REM bas = &AFB8 for BASIC I
● 750 PROCassemble_generators
● 760 ENDPROC
● 770
● 780 DEF PROCassemble_generators
● 790 REM *****
● 800 F% = &C00
● 810 [OPT 2
● 820
● 830 .IRQ
● 840 \***+
● 850 INC &10

```

HARDWARE

See 'Random numbers', page 78.

```
● 860 JMP oldIRQ
● 870
● 880 .int_on
● 890 \*****
● 900 SEI
● 910 LDA #IRQ MOD 256
● 920 STA &204
● 930 LDA #IRQ DIV 256
● 940 STA &205
● 950 CLI
● 960 RTS
● 970
● 980 .int_off
● 990 \*****
● 1000 SEI
● 1010 LDA #oldIRQ MOD 256
● 1020 STA &204
● 1030 LDA #oldIRQ DIV 256
● 1040 STA &205
● 1050 CLI
● 1060 RTS
● 1070
● 1080 .basRND
● 1090 \*****
● 1100 JSR bas
● 1110 LDA &0D
● 1120 RTS
● 1130
● 1140 .newRND
● 1150 \*****
● 1160 LDA &0E
● 1170 EOR &0D
● 1180 EOR &10
● 1190 ROR A
● 1200 STA &0E
● 1210 ROR &0D
● 1220 ROR &0E
● 1230 DEY
● 1240 BNE newRND
● 1250 RTS
● 1260
● 1270 ]
● 1280 testcode% = P%
● 1290 ENDPROC
● 1300 DEF PROCassemble_tests
● 1310 REM *****
● 1320 FOR opt% = 0 TO 2 STEP 2
● 1330   P% = testcode%
● 1340   [OPT opt%
● 1350
● 1360   .RNDmap
● 1370   \*****
● 1380   LDA #25
● 1390   JSR &FFEE
● 1400   LDA #69
● 1410   JSR &FFEE
● 1420   LDY #8
● 1430   JSR rndGEN
● 1440   JSR &FFEE
● 1450   LDY #2
● 1460   JSR rndGEN
● 1470   AND #3
● 1480   JSR &FFEE
● 1490   LDY #8
● 1500   JSR rndGEN
● 1510   JSR &FFEE
● 1520   LDY #2
● 1530   JSR rndGEN
● 1540   AND #3
● 1550   JSR &FFEE
● 1560   LDA #&81
● 1570   LDX #0
● 1580   LDY #0
● 1590   JSR &FFF4
● 1600   BCS RNDmap
● 1610   RTS
● 1620
● 1630   .RNDhist
● 1640   \*****
● 1650   LDA #0
● 1660   TAX
● 1670   .wipe
● 1680   STA B%,X
● 1690   STA C%,X
● 1700   INX
● 1710   BNE wipe
● 1720
● 1730   .sample
● 1740   LDY #8
● 1750   JSR rndGEN
● 1760   TAX
● 1770   INC B%,X
● 1780   BNE sample
● 1790   INC C%,X
● 1800   LDA &404
● 1810   CMP C%,X
● 1820   BNE sample
● 1830   RTS
● 1840
● 1850   J
● 1860   NEXT
● 1870 ENDPROC
```

See 'Teaching toddlers' page 104

● Listing 1. Introducing children to micros

```

10 REM Youngest Users Micro Activity Pack.
20 REM (c) Joe Telford
30 W%=-5
40 K%=-1:*KEY 10 OLD:MGOT050:M
50 REM THIS LINE IS IMPORTANT
60 ON ERROR MODE6:PROCerror
70 MODE6:PROCsetup
80 IF K%=-1 choice=FNmenu ELSE choice=0
90 IF choice=0 choice=K%
100 K%=choice
110 CLS:MODE5:CLS:VDU19,0,4,0;0;
120 PROCxcrsr(0)
130 IF choice=1 PROCpattern
140 IF choice=2 PROCshape
150 IF choice=3 PROCshapegame
160 IF choice=4 PROCdrawsound
170 IF choice=5 PROCsketch
180 IF choice=6 MODE7:CLS:PROCend
190 END
200 DEFPROCend
210 PRINT'"Bye.":*FX220,27
220 *FX4,0
230 END
240 DEFPROCerror
250 IF ERR= 17 RUN
260 CLS:REPORT:PRINT" @ "; ERL
270 PROCend
280 DEFPROCsketch
290 GCOL0,129:CLG:GCOL0,2:PROCreect(0,992,1280,32,1)
300 sx=640:sy=512
310 REPEAT
320 PROCrssr(sx,sy)
330 k=FNkey
340 PROCrssr(sx,sy)
350 IFk=0 sy=sy+16 ELSEIFk=1 sy=sy-16 ELSEIFk=2 sx=sx-16 ELSEIFk=3 sx=sx+16 EL
SEIFk=4 col=(col+1) MOD4:GCOL0,col:PROCreect(0,992,1280,32,1):MOVEsx,sy
360 IFsx>1279 sx=sx-16:VDU1
370 IFsx<1 sx=sx+16:VDU7
380 IFsy>992 sy=sy-16:VDU7
390 IFsy<1 sy=sy+16:VDU7
400 DRAW sx,sy
410 UNTIL FALSE
420 ENDPROC
430 DEFPROCcrsr(x,y):GCOL4,0:MOVEx,y:MOVEx+8,y:DRAWx-8,y:MOVEx,y+8:DRAWx,y-8:M
OVEx,y:GCOL0,(col MOD 4):ENDPROC
440 DEFPROCshape:GCOL0,col:PROCreect(0,992,1280,32,1)
450 REPEAT
460 sx= RND(1280):sy=RND(1024)
470 REPEAT PROCreect(0,992,1280,32,1)
480 PROCrssr(sx,sy):VDU1
490 delay= TIME+W%*100:*FX21,0
500 REPEAT k=FNkey:UNTIL k>-1 OR TIME>delay
510 PROCrssr(sx,sy)
520 r=RND(250)+50
530 IF k=0 PROCcircle(sx,sy,r,r,1):UNTIL 0
540 IF k=1 PROCreect(sx,sy,r,r,1):UNTIL 0

```

XI

Continued ►

See 'Teaching toddlers' page 104

XII

● ◀ *Continued*

```
● 550 IF k=2 PROCreect(sx,sy,2*r,r,1):UNTIL0
● 560 IF k=3 PROCtri(r*COS(RAD(90)),r*SIN(RAD(90)),r*COS(RAD(210)),r*SIN(RAD(210))
● ),r*COS(RAD(330)),r*SIN(RAD(330)),1):UNTIL0
● 570 IF k=4 col=(col+1) MOD 4:GCOL0,col:PROCreect(0,992,1280,32,1)
● 580 UNTIL TRUE:UNTIL FALSE
● 590 ENDPROC
● 600 DEF PROCpattern:CLS:PRINTSTRING$(20,CHR$155);:VDU28,0,31,19,1
● 610 CLS:char=65
● 620 REPEAT:*FX21,0
● 630 REPEAT k=FNkey:UNTIL k>-1
● 640 IF k=4 col=col+1:IF (col MOD 4)=0 col=col+1
● 650 COLOUR col:VDU26:PRINTSTRING$(20,CHR$155);:VDU28,0,31,19,1
● 660 IF k=0 char= char+1
● 670 IF k=1 char= char-1
● 680 IF k=2 char= RND(127)+32
● 690 IF k=3 char= char
● 700 IF char=155 char=33
● 710 IF char=32 char=154
● 720 FOR I%= 1 TO 600:VDUchar:NEXT
● 730 UNTILFALSE
● 740 ENDPROC
● 750 DEFPROCdrawsound:GCOL0,128:CLG:xpos=50
● 760 note=6:REPEAT:*FX21,0
● 770 REPEAT k=FNkey:UNTIL k>-1
● 780 IF k=0 note= note+1
● 790 IF k=1 note= note-1
● 800 IF k=2 note= RND(14)-1
● 810 IF k=3 note= note
● 820 IF note=14 note=0
● 830 IF note=-1 note=13
● 840 GCOL 0,col:PROCplaynote(note)
● 850 UNTILFALSE
● 860 DEFPROCplaynote(n)
● 870 IF xpos>1200 xpos=50:GCOL0,128:CLG
● 880 SOUND 1,-15,n*4+52,8
● 890 GCOL0, RND(3)
● 900 PROCreect(xpos,n*70+20,100,70,1)
● 910 xpos=xpost+100
● 920 FOR wt%=- 1 TO 300:NEXT
● 930 ENDPROC
● 940 DEFPROCshapegame
● 950 sx=640:sy=512
● 960 VDU19,0,5,0;0;
● 970 REPEAT:GCOL0,128:CLG:GCOL0,RND(3)
● 980 shape= RND(4)-1:r=RND(300)+50:r1=r*2
● 990 IF shape=0 PROCcircle(640,512,r,r,1)
● 1000 IF shape=1 PROCreect(640-r/2,512-r/2,r,r,1)
● 1010 IF shape=2 PROCreect(640-r1/2,512-r/2,r1,r,1)
● 1020 IF shape=3 PROCtri(r*COS(RAD(90)),r*SIN(RAD(90)),r*COS(RAD(210)),r*SIN(RAD
● (210)),r*COS(RAD(330)),r*SIN(RAD(330)),1)
● 1030 REPEAT:REPEAT:*FX21,0
● 1040 FOR wt%= 0 TO 300:NEXT
● 1050 k=FNkey: UNTIL k>-1
● 1060 IF k<>shape SOUND 0,-15,5,10
● 1070 UNTIL k=shape
● 1080 SOUND 0,-15,0,10
```

See 'Teaching toddlers' page 104

```

1090 UNTIL FALSE
1100 DEFPROCsetup
1110 DIMkey$(3)
1120 key$(0)="123!""£qweaszxQWEASZX"+CHR$9+CHR$27+CHR$1+CHR$19+CHR$17
1130 *KEY0 2
1140 *KEY1 3
1150 *KEY2 4
1160 key$(1)="4567RTYUDFGHCVBN$%&'rtyudfgvcbn"
1170 *KEY3 5
1180 *KEY4 6
1190 *KEY5 7
1200 *KEY6 8
1210 *KEY7 9
1220 key$(2)="B90=()-iop@IOPJKLjk1+;Mm<, >. ?/"
1230 *KEY8 0
1240 *KEY9 =
1250 key$(3)="--~\{\[_*:\]}"+CHR$135+CHR$136+CHR$137+CHR$138+CHR$139+CHR$13+CHR$127
1260 VDU19,0,4,0;0;
1270 col=2:*FX4,1
1280 *FX220,0
1290 VDU23,128,0,0,0,0,255,0,0,0
1300 VDU23,129,255,129,129,129,129,129,129,255
1310 VDU23,130,32,32,32,32,32,32,32,32
1320 VDU23,131,1,2,4,8,16,32,64,128
1330 VDU23,132,128,64,32,16,8,4,2,1
1340 VDU23,133,0,255,0,255,0,255,0,255
1350 VDU23,134,170,170,170,170,170,170,170,170
1360 VDU23,135,&11,&22,&44,&88,&11,&22,&44,&88
1370 VDU23,136,&88,&44,&22,&11,&88,&44,&22,&11
1380 VDU23,137,255,129,189,165,165,189,129,255
1390 VDU23,138,60,66,129,129,129,129,60,66
1400 VDU23,139,0,255,129,129,129,129,255,0
1410 VDU23,140,0,126,66,66,66,66,126,0
1420 VDU23,141,0,24,36,66,66,36,24,0
1430 VDU23,142,0,24,24,24,60,60,126,24
1440 VDU23,143,0,36,126,126,126,126,60,24
1450 VDU23,144,0,6,6,8,16,96,96,0
1460 VDU23,145,0,96,96,16,8,6,6,0
1470 VDU23,146,0,102,102,24,24,102,102,0
1480 VDU23,147,0,126,68,72,80,96,64,0
1490 VDU23,148,0,2,6,10,18,34,126,0
1500 VDU23,149,1,3,7,15,31,63,127,255
1510 VDU23,150,255,127,63,31,15,7,3,1
1520 VDU23,150,255,254,252,248,240,224,192,128
1530 VDU23,151,128,192,224,240,248,252,254,255
1540 VDU23,152,0,16,56,84,254,84,16,56
1550 VDU23,153,0,56,56,16,254,16,40,68,68
1560 VDU23,154,0,56,56,16,254,16,56,124,68
1565 VDU23,155,255,255,255,255,255,255,255,255
1570 ENDPROC
1580 DEF FNkey :LOCALA$
1590 A$=INKEY$(0):IF A$="" ==1
1600 IF A$=" " THEN =4
1610 IF (INSTR(key$(0),A$))>0 THEN =0
1620 IF (INSTR(key$(1),A$))>0 THEN =1

```

XIII

Continued ►

See 'Teaching toddlers' page 104

● ▲ Continued

```
● 1630 IF (INSTR(key$(2),A$))>0 THEN =2
● 1640 IF (INSTR(key$(3),A$))>0 THEN =3
● 1650 ==1
● 1660 DEF FNmenu
● 1670 CLS:K%=0
● 1680 PRINT'" Youngest Users Micro-Activity Pack"
● 1690 PRINT
● 1700 sp$=STRING$(5," ")
● 1710 PRINT' sp$;"Please choose from:-"
● 1720 PRINT' sp$;"Character patterns.....1"
● 1730 PRINT' sp$;"Draw Shapes.....2"
● 1740 PRINT' sp$;"Shape game.....3"
● 1750 PRINT' sp$;"Draw Sound.....4"
● 1760 PRINT' sp$;"Sketch pad.....5"
● 1770 PRINT' sp$;"END.....6"
● 1780 PRINT' sp$;"Which? ";
● 1790 REPEAT A$=GET$:UNTIL A$>"0" AND A$<"7" :PRINTA$
● 1800 IF A$="6" =VALA$
● 1810 IF A$="2" PRINT' CHR$134;sp$"Delay? (1-9 secs) " ;:REPEAT B$=GET$:UNTIL B$>"0" AND A$<="9" :PRINTB$:W%=VALB$
● 1820 PRINT' '' FIT OVERLAY. THEN PRESS ANY SECTION"
● 1830 *FX21,0
● 1840 REPEAT UNTIL FNkey >-1
● 1850 =VALA$
● 1860 DEFPROCcircle(x,y,r1,r2,f)
● 1870 LOCAL z,x%,y%
● 1880 MOVEx+r1,y:MOVEx+r1,y
● 1890 FORz=0TO 6.4STEP.2
● 1900 x%=x+r1*COSz:y%=r2*SINz
● 1910 IFF<>1 DRAWx%,y+y% ELSE PLOT85,x%,y+y%:PLOT85,x%,y-y%
● 1920 IFF=1ANDz>3.2 z=6.4
● 1930 NEXT:ENDPROC
● 1940 DEFPROCrect(x,y,1,w,f)
● 1950 MOVEx,y:DRAWx+1,y
● 1960 IFF=0 DRAWx+1,y+w ELSEPLOT85,x,y+w
● 1970 IFF=0 DRAWx,y+w ELSEPLOT85,x+1,y+w
● 1980 MOVEx,y+w:IFF=0 DRAWx,y ELSEMOVEx,y
● 1990 ENDPROC
● 2000 DEFPROCTri(x1,y1,x2,y2,x3,y3,f)
● 2010 VDU29,sx;sy;
● 2020 MOVE x1,y1
● 2030 IFF=0 DRAWx2,y2 ELSE MOVE x2,y2
● 2040 IFF=0 DRAWx3,y3:DRAWx1,y1 ELSE PLOT85,x3,y3:MOVEx1,y1
● 2050 VDU29,0;0;
● 2060 ENDPROC
● 2070 DEFPROCxcrsr (x):IFx=0 THEN VDU23;8202;0;0;0; :ELSE VDU23;29194;0;0;0;
● 2080 ENDPROC
```

See 'Zoo time for micros' page 112

```

10 REM **** ACTIVITY BOARD ***
30 REM *** SUSAN KINGSBURY ***
40 REM *** BBC MODEL B ***
50 REM *** AUGUST 1984 ***
60 REM ****
70 DIM B$(8)
80 DIM D$(100)
90 READ A$
100 FOR I=1 TO 8
110 READ B$(I)
120 NEXT I
130 RESTORE
140 D=0
150 CLS:PRINT"NOTES FOR TEACHER"
160 PRINT
170 PRINT"FRED IS VISITING THE ";A$;"."
180 PRINT"AT EACH PLACE HE VISITS, A SENTENCE"
190 PRINT"WILL APPEAR ON THE SCREEN."
200 PRINT
210 PRINT"WHEN HIS VISIT IS COMPLETE, PRESS P"
220 PRINT"AND THE STORY OF HIS VISIT WILL BE"
230 PRINT"PRINTED ON THE SCREEN AND, IF REQUIRED,"
240 PRINT"ALSO ON THE PRINTER."
250 PRINT
260 PRINT"DO YOU WISH TO USE THE PRINTER?"
270 INPUT P$
280 PRINT
290 PRINT"PRESS SPACE BAR TO CONTINUE"
300 Z$=GET$ : IF Z$<> " " THEN 300
310 CLS:PRINT TAB(16,12);CHR$(141); A$:PRINT TAB(16,
13);CHR$(141);A$
320 IF ?65120=255 THEN 320
330 CLS
340 L=500
350 X$=INKEY$(0) : IF X$="P"THEN 560
360 C=(?65120)
370 G=255-C
380 IF L=G THEN 350
390 IF G>0 THEN GOSUB 410
400 GOTO 350
410 CLS:L=G
420 IF G=1 THEN J=1
430 IF G=2 THEN J=2
440 IF G=4 THEN J=3
450 IF G=8 THEN J=4
460 IF G=16 THEN J=5
470 IF G=32 THEN J=6
480 IF G=64 THEN J=7
490 IF G=128 THEN J=8
500 CLS
510 PRINT CHR$(141);B$(J):PRINT CHR$(141);B$(J)
520 D=D+1
530 D$=(D)=B$(J)
540 X$=INKEY$(120) : IF X$="P"THEN 560
550 RETURN
560 CLS
570 FOR K=1 TO D
580 PRINT CHR$(141);D$(K)
590 PRINT CHR$(141);D$(K)
600 NEXT K
610 IF P$<>"YES"THEN END
620 VDU 2,21
630 PRINT A$
640 PRINT
650 FOR K=1 TO D
660 PRINT D$(K)
670 NEXT K
680 VDU6
690 PRINT CHR$(3)
700 END
710 DATA ZOO
720 DATA Fred is buying a ticket to the zoo.
730 DATA These camels have two humps!
740 DATA Fred is frightened of the gorillas.
750 DATA Here is a brown bear and a polar bear.
760 DATA The keeper is feeding the sea lions.
770 DATA Fred is laughing at the funny monkeys.
780 DATA What a big ice cream Fred is eating.
790 DATA Fred is looking at the lions.

```

XV

Listing 1. Fostering creativity in the classroom

See 'Avoiding invalid data entry', page 127.

XVI

```

● 100 REM LEFT-JUSTIFIER FOR
● 110 REM ATOM BASIC STRINGS.
● 120 REM POINTER TO STRING TO
● 130 REM BE ANALYSED IS PASSED
● 140 REM IN BASIC VARIABLE "X".
● 150;
● 160 DIM LL(4),L(1)
● 170 FOR N=0 TO 4; LL(N)=-1; NEXT
● 180 S=#80; REM POINTER FOR STRING
● 190 X=#339; REM LEAST SIGNIFICANT BYTE
● 200 REM OF BASIC VARIABLE "X"
● 210 INPUT"ASSEMBLE FROM (#)" H
● 220 INPUT"LIST ASSEMBLY (Y/N)"$L
● 230 IF $L="N" P,$21
● 240 FOR N=1 TO 2; P=H
● 250;
● 260 REM ON ENTRY, THE X REGISTER
● 270 REM HOLDS THE LO-BYTE VALUE OF
● 280 REM THE POINTER TO THE STRING
● 290 REM TO BE LEFT-JUSTIFIED.
● 300 REM (PASSED VIA 'LINK' COMMAND)
● 310C
● 320:LL0 STX S    \set up Pointer
● 330    LDA X+27 \2nd byte of BASIC
● 340    STA S+1 \variable 'X'
● 350    LDY @#FF \Y=-1 for Preincrement
● 355\
● 360:LL1INY \get next char
● 370    LDA (S),Y \in string
● 380    CMP @#20 \continue until non-
● 390    BEQ LL1 \space char found.
● 400    TYA \if no leading
● 410    BEQ LL4 \spaces, exit.
● 415\
● 420    LDX @0 \get non-space
● 430:LL2 LDA (S),Y \chars in string
● 440    STA (S,X) \and Put at start.
● 450    INC S . \Point to next
● 460    BNE LL3 \char.
● 470    INC S+1
● 480:LL3 CMP @#0D \check if end
● 490    BNE LL2 \of string moved.
● 495\
● 500:LL4 RTS \exit
● 510J
● 520 NEXT
● 530 P,$6
● 540 @=1
● 550 P,"SAVE""LEFTJUST"""&H," ",&P"
● 560 END
●

```

```

● a.)
● 1000 REM ATOM BASIC STRING
● 1010 REM LEFT-JUSTIFIER ROUTINES.
● 1020 REM USE BASIC VARIABLE X TO
● 1030 REM INDICATE STRING TO BE
● 1040 REM EXAMINED.
● 1050 REM
● 1060J IF ?X>32 RETURN
● 1070 Z=0
● 1080 DO
● 1090 Z=Z+1
● 1100 UNTIL X?Z>32
● 1110 $X=$X+Z
● 1120 RETURN
●
● b.)
● 1000jZ=-1:D0Z=Z+1;U,X?Z>32;
● $X=$X+Z;R.
●
● c.)
● 1000JIF?X=32 D0$X=$X+1;U.?X>32
● 1010R.
●

```

Program 1. Three Basic variations
for left-justification

Program 2. Machine-code version of string left-justifier

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Each £7.95 per cassette or £10.95 per disc (40/80 track).

Price includes VAT and postage.

Both games need OS1.0, or later, and 32k.
Developed, produced and tested by Micrograf.



SWORD MASTER is one of the few two-player games around, and is designed for joystick or keyboard.

Sword Master by Ken Worrall is based on the fencing rules written in 1190 by Herman von Salza for the Deutschritter Order of Teutonic Knights. It features full-colour machine code animation of a sword duel between the players shown on screen as knights.

Full instructions, music, sound effects, player rankings (from Greenhorn to Swordmaster) and a roll of honour (which can be saved) are all included. The game also closely reflects the rules, style and dress of the Deutschritter Order.



TREK was the first game to take advantage of voice synthesis on the BBC micro – and uses joystick or keyboard.

Trek puts you in charge of a Starship with the task of wiping out an alien fleet. It's an excellent adaptation of the classic game with 7 screen displays, 3 on-board computers and 2 weapon systems.

Versions have been written for BBC micro and Electron to use both machines to their full. The BBC tape uses voice synthesis (if the chips are fitted).

The game has been extensively developed from Tim Heaton's famous Trek III. It barely fits into 32k.

DISC UPGRADE SERVICE

Return your cassette of Trek or Swordmaster, and we will exchange it for a disc (which will run on 40 or 80-track drives) for just £3.50. Please specify Amcom, Watford or Acorn DFS.

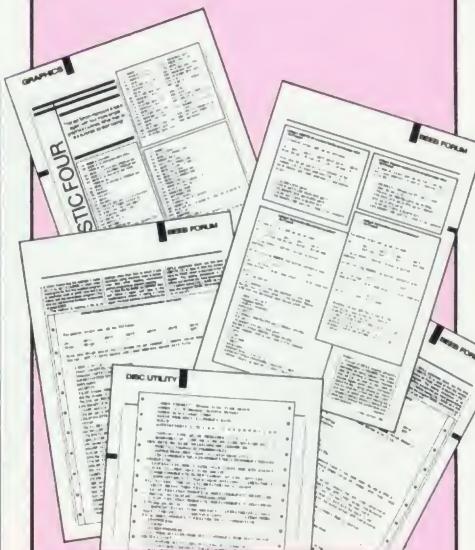
PLUS

ARTICLE LISTINGS ON CASSETTE

Yes, at last, the tape you've been crying out for! Save the wear on your fingers by sending for one of our cassettes giving all the major listings in this issue.

Each cassette costs £3.75 (inclusive) for the Electron and BBC micro. This includes a menu and disc transfer routine to help you find your way around – and use on your own programs.

The tapes come with BBC programs on one side and Electron programs as the other, so it shouldn't be possible to mix the two.
Order form overleaf.



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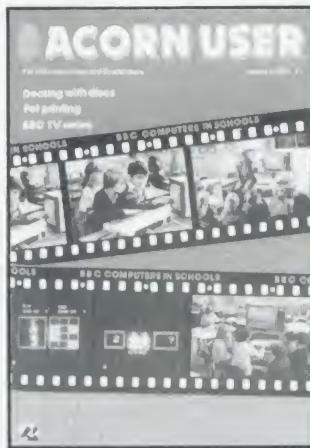
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6. January 1983 MEP school launch. *FX commands for sound. Second BBC TV series. Machine code 3–two pass assembly. Disc drives for the Beeb. Programming forum. Program protection. Micros in schools – new series. Commodore Pet printer used with Beeb. BBC programs written on an Atom. Extra Atom memory.



7. February 1 MHz bus examined. 3D Atom graphics. Atom BBC Board reviewed. Machine code 4–memory. BBC Computer Literacy update. Atom error handling. Micros in schools 2–getting organised. Hints & Tips. Beeb Forum. Reviews of *Wordwise* and the Amber printer.

8. March Chess on the BBC micro. Sound on the Beeb. Printers for beginners. Atom analogue converter. Schools 3–micros and maths. Machine code 5–indirect addressing. DIY lightpen. MEP's *Microprimer* review. Atom Ross toolkit review. Beeb Forum. Assembly language and Pascal book reviews.

9. April *Hexangle* game listing. Bach on the Beeb. Hints & Tips on disc drives. Machine code 6–the CALL statement. Interfacing the 1 MHz bus. Schools 4–young children and micros. Graphics listings. Printers for beginners 2. Reviews to BCPL, educational software and Atom software.

10. May Review of Basic II. Graphics listings. New *FX calls in OS1.2. Colour mixing on the Beeb. Jazz, blues and folk on the BBC. Schools 5–language development. DIY Beeb interface box. Atom sound board. A to Z of printing: how to get going. Hints & Tips: PROCs, discs and FNs. Printer, software and book reviews.

11. June Techniques series – sorting Hints & Tips: 50p network. Drawing techniques and CAD. Machine code: interrupts. Schools 6–information technology. Atom Forum. Beeb Forum. Printers – write your own graphics dumps. Comparative review of *View* and *Wordwise*. Three graphics packages reviewed. Test of *Acorn User's* interface box.

12. July Techniques – hash tables. Hints & Tips: logic made easy. Recursion and graphics. Handling strings. Two ideas for passing variables. Beeb aids the blind. DIY second keyboard. Beeb Forum. Sounds on the Atom. Hardware, firmware, software and book reviews. Atom Forum.

13. August Printer graphics and dumps. Techniques – Tree structures and sorting. All the fun of the fair. 40/80 disc copier. Colour painting. Basic II: random access files. Screen dumps for

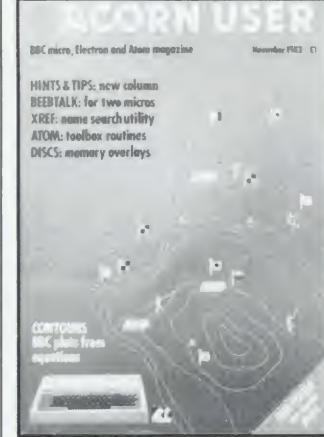
Olivetti, Centronics and Seikosha. Atom strings. Reviews of Tandy CGP115 printer, five educational packs, A to D converter.

14. September Techniques – ink-bLOTS and mazes. Painting by lightpen. DFS space explored. Beeb Forum. *Mega Monsters* game listing. Machine code graphics dumps. Atom Forum. Atom cassette recorder check. Reviews of Atom RAM boards, Cumana disc manual. *Logo* for schools, Hobbit floppy tape and books.

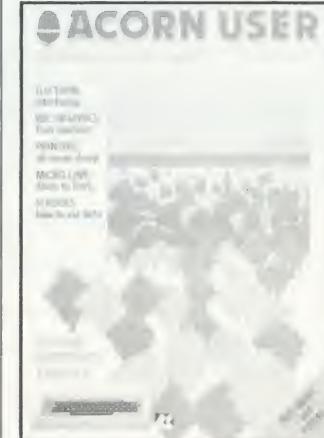
15. October Women and computing. Techniques – random numbers. Review of Computer Concepts' *Beebcalc*. Fractal graphics. 57 files on 40 & 80 track discs. *Vampire* game listing. Beeb Forum. Assembly code controls tab key. Osfile merging. Atom future. Atom verify routine. Reviews of *Vu-Type*, Procyon Atom book, Epson FX80, Teletext adapter, disc drive, software.

16. November Techniques – impossible problems. Contour graphics. Connecting two Bebs together. XREF: sorts & lists variable, function and procedure names. Assembler utilities in Basic II. OS, VDU, *FX, OSBYTE calls – pull-out poster.

Disc overlays. Adding extra Atom commands. Reviews of 7 educational packs, Atom ROM, books, games.



17. December Random graphics. Animated graphics in colour. Techniques – graphs. Hints & Tips. Universal printer dump. 6522 connected to the Electron. Saving machine code. Beeb Forum. Graphics pull-out poster. Index: July 82–July 83. Forum Extra: EQUS. BBC helps the disabled. Schools – data processing. Transferring data between Bebs, Atoms ... or



Pets. Atom block demolition utility. Atom disassembler program. Reviews of software, books, educational programs from Chalksoft.

18. January 1984: Games special issue Techniques – graphs part 2. Stacks and queues. Basic and languages. Hints & Tips. Voice chip revealed. How to write games. Electron interfacing. Beeb Forum. Life graphics routines. *Defencecom* game listing. *The Train Game* listing. Machine code graphics. Where to put machine code. Schools – handling data. Juki daisywheel printer examined. Atom Forum and adventure. Reviews of utilities, software, *Beeline* wordprocessor, educational packages, two chess programs.



19. February: Adventures special issue Techniques – efficient sorts. PROC for a numeric keypad on the Beeb keyboard. 12 graphics listings. Random access filing on disc. Locking files. MCP40 printer/plotter looked at. Hints & Tips. Beeb Forum. Make discs readable on 40 and 80 track drives. Screen memory organisation. Hints on adventure design. Adventure action. Adventure ideas in computer language. Text compression. Word-crunching. VIA chip on Electron to drive a parallel printer. Atom Forum. Schools – simulation packages. Reviews: *Disc Doctor*, Leasalink's DFS upgrade, Hitachi's microdrive system, Solidisk's sideways RAM board, software.

20. March Utility: timing routine. Fractals. Teletext and mode 7 dump. ROMs reviewed. Hints & Tips. Beeb Forum. Add sounds to your games. Learn Lisp 1. Cube graphics. Printer driver for View Basic II from Basic I. Beeb's ADC chip. Atom Forum. Listing formatter for

the Atom. Atom 'bytes free' routine. Schools – test of *Factfile*. Keyboard skills. Amcom DFS v Acorn DFS. Reviews: *Beebpen* wordprocessor, Atom expansion system, software, books.

21. April Beeb graphics on TV. 6845 chip explored. Advanced filing systems. Lisp 2. Hints & Tips. Beeb Forum. Choose disc tracks to copy. Function key editing. Teletext dumps. CES scrutinised. Passing variables. Computer Concepts' graphics ROM. Schools – simulations. Calculating Easter dates. Better programming. Atom Forum. Atom ROM routines. Converting BBC to Atom Basic. Three printers compared. Reviews: software, Aries B20 RAM board, *Toolkit*, Monitors.

22. May Bitstik graphics system. Hints & Tips. 6502 second processor examined. Lisp 3. Beeb Forum. Disc utility to keep track of available space. Statistics. Pattern graphics. OSWORD explained. 4 colour graphics listings. Second-hand disc drives. Education – do girls get a fair deal? Atom Forum. BBC to Atom Basic 2. Reviews: British Micro's *Graffiti*, *Edword* wordprocessor, 4 sprite generators, Opus microdrive, Beastly, software.

23. June Acorn Z80 second processor. Forth. Graphics to brighten up your games. Soft Pottery graphics. Go faster and save memory space. Rapid search and load routine for tapes. How the Beeb and Electron work 1. Business: reviews and how to gently enter office computerisation. Education – adult literacy. Dumping Atom programs on the BBC. Atom Forum. Software copyright laws. Hints & Tips. Techniques – B-Trees. Beeb Forum. Reviews of monitors, printers, books, software, adventures, EPROM programmer.

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RECENTLY we received a communication from our old friend Mad Alex saying that his very own competition would shortly be on its way to us. Since Mad Alex was then messing around with the laws of time we had in fact received it three days earlier.

A close examination revealed that he had sent it from Ambridge up to a passing asteroid which had deflected the signal onto a satellite. The message was then bounced off the moon into a NASA computer in Houston and a carrier pigeon brought the printout across the Atlantic to our offices in Long Acre.

Unfortunately, Alex seems to have got his ASCII in a twist so we're not quite sure what the competition is. However, Torch Unicomm packages comprising modem and three software packs await the first five people out of our sack who have deciphered the message and solved its contents. The answer should be in the form of 12 phrases. Answers on a postcard please to August Competition, *Acorn User*, 68 Long Acre, London WC2E 9JH, to arrive not later than September 3, 1984.

Simon Dally

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COMPETITION RULES

THE names of the winners of this competition will be printed in the November issue, and they will be notified by post before then. Please note that we cannot accept any phone calls or correspondence on the competition. Also, we cannot return entries.

Having said that little lot, good luck!

Turn to page 161 for an exclusive review of the Unicomm system



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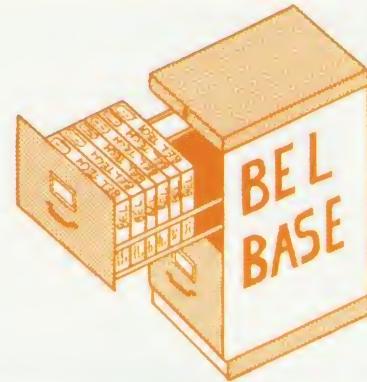
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ALEX**

Decipher the message to reveal 12 phrases

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\$ PLAN FOR £ BUSINESS

John Vaux takes a look at the wordprocessor, card index and spreadsheet with Acorn's Z80

89

THE BUNDLED software that Acorn is supplying with its Z80 second processor was summarised in an outline review in the June issue of *Acorn User*, and last month we looked more closely at the *Accountant* package from Compact Software International. Now it's the turn of a set of three programs written by Chang Laboratories, the *Plan* series. This set consists of a wordprocessing package called *MemoPlan*, a card index type system called *FilePlan*, and a spreadsheet program with graphics output called *GraphPlan*.

MemoPlan

MemoPlan is an interesting-looking wordprocessing program with some nice features not found in comparable programs. In addition to most of the facilities of other packages it will let you work on more than one document at a time, switching between them on a function key.

You may also have two documents on the screen together and hop from one to the other. Another unusual feature is that documents are automatically written to disc at regular intervals while you work on them.

Most commands are provided on the function keys, either alone or in with Shift or Control.

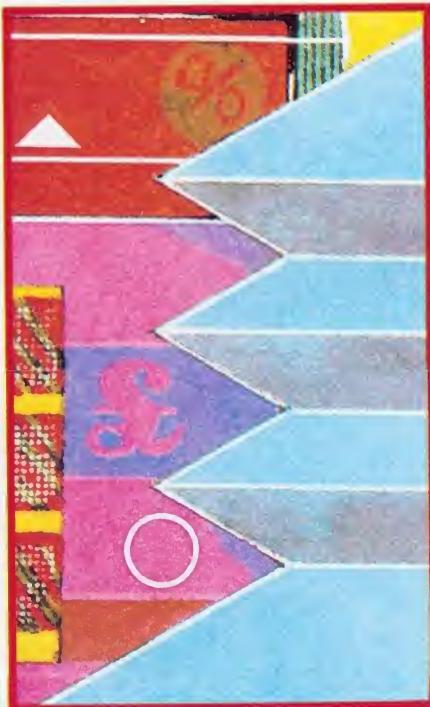
As is usual, typing is done continuously, new lines being started automatically. Pressing RETURN is not required unless you want to start a new line or new paragraph. New pages are started based on the prespecified number of lines per page. A new page may be forced using a strange combination of keys (no function key for this one) and there's an indicator in your text that this has been done.

The only special printer attribute supported is underlining and portions of text may be underlined using a special function key, although there is no on-screen indication that text has been underlined. Operations provided

on function keys include delete word/line/paragraph, full cursor control on the arrow keys, insert, overwrite and right justification modes.

Line length setting, indentation and tab positions are provided for. These are easily changed using the format command. Text can be reformatted one paragraph at a time using the reformat key.

A word, line or paragraph may be



moved by deleting it, moving the cursor to its new location and pressing the restore key.

The text remains available until the next delete so it can be restored to several places. You may also move blocks of text by putting the cursor at the start, pressing the mark key, moving the cursor to the end of the block, pressing the lift key, moving the cursor to the new position and pressing the restore key – easier to do than

describe! Again, text may be duplicated by restoring several times.

All the usual search and replace facilities are provided, including search only, automatic find and replace and selective search and replace, in which you are prompted before each replace operation. A sensible precaution, as it's easy to make changes you didn't intend. You may order matching on capitals and non-capitals or on capital first letter only.

Now we come to one of the especially attractive features of the program. By default five document areas are provided. This may be changed (but only if there is no data currently stored) to any number of areas from 1 to 7. Total space reserved for these documents may be set in multiples of 8k from 16k to 160k. This is only the working document area within *MemoPlan*; you may also save documents to disc in the normal way.

You can switch between these documents on a function key. As it brings the document onto the screen it positions the cursor at exactly the point it occupied when you left it.

There's more! You can display two documents at the same time, one above the other, and hop from one to the other. You can scroll them independently, change the number of lines occupied by each (yes, variable-sized windows) and move text from one to the other. This is a powerful feature and I was impressed to find it in this 'free' program.

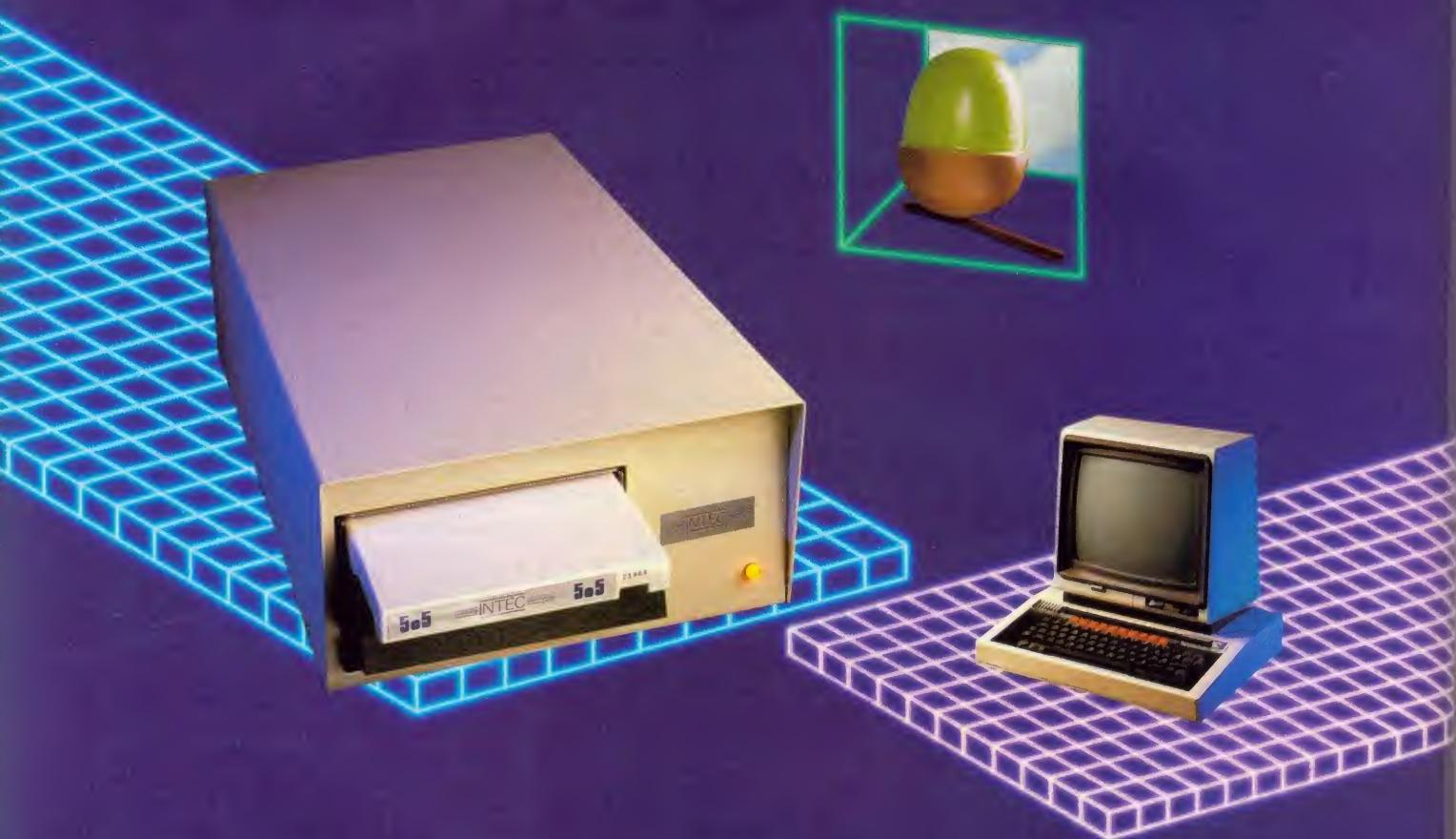
Two types of printer are supported – Epson or equivalent and Acorn/Olivetti ink-jet. For any other types you are advised to consult your dealer.

Printing is pretty straightforward, without a lot of the extra features of, for example, Wordstar. You can ask for several copies, specify page numbering, page headings, and there are other options. These features should be adequate for most purposes.

It's quite easy to set up a mail-merge,

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using the wordprocessor in conjunction with *FilePlan*, even though the procedure is split across two manuals.

A minor problem of *MemoPlan* is that function key 9 is used, and this is adjacent to the break key. Hitting the break key aborts the program, but all is not lost, thanks to the automatic back-up of documents. You restart the program and it tells you to run the recover program, which restores you to where you were last time the auto back-up was done, so you should lose little.

This excellent wordprocessor is worth most of the price of the second processor alone. I was brought up on *Wordstar*, which is the one the rest are judged by, and I have no hesitation in comparing this one favourably with it. There are pros and cons, of course, but I used *MemoPlan* to prepare this article and was very happy with it. The documentation is very good and in the same style as that for the rest of the software provided.

FilePlan

In this computerised filing system records may be updated, sorted, selected and displayed or printed. As noted, *FilePlan* can also be used in conjunction with *MemoPlan* to give a mail-merge facility to print address labels and/or customised letters.

The records are processed on the screen in a form of worksheet, a textual version of the more familiar spreadsheet for manipulation of numeric data. The whole worksheet is a file, each row is a data record and each vertical field within a record (ie a cell) is an item of data.

Records may be sorted on a field or a number of fields to give a sorted list, or selected on specified criteria to give other lists. Any worksheet or list may be displayed or printed.

Default record size is 100 characters and this may be increased to about 800.

Before using a worksheet for the first time it must be named and each field specified as to its name, length and type, etc. A useful facility here is that you may specify your own prompt message to appear when a field is to be filled in on data entry. You can also provide a list of valid codes to be used to check input data and which expand valid data, for example, M = male, F = female. Range checks may also be made.

Full use is made of the function keys for data entry. The cursor up, down, left and right keys, together with Control and Shift, are used to move around

your worksheet, which appears like a spreadsheet on the screen with the current cell or field highlighted. At each cell the relevant prompt message appears and data is entered or changed. The manual does not say how

Original worksheets or lists may be printed. You can specify a heading, a date, single/double spacing or subtotaling on numeric fields. Over-wide prints can be truncated or continued on the next line. Label prints prompt for full details to ensure correct alignment.

A single record can be displayed field by field vertically – useful for large records that don't fit on a single-line display.

Worksheets may be copied, with the option to expand the space allowed for each record.

FilePlan is another professionally presented package with good, well-produced documentation. It performs its task of implementing a simple indexed data storage and retrieval system adequately, without pretending to be a full database system.

GraphPlan

The third package in this group is a traditional spreadsheet application with the addition of useful graphics options. For anyone who still doesn't know, a spreadsheet is a large grid of rows and columns in which you can enter and manipulate numeric data (usually financial).

The display screen serves as a movable window on this data, showing at any time a whole screenful of data. Facilities are provided for rapid recalculation of the data, allowing 'what-if' changes to selected parts of the data to be performed. *GraphPlan* allows arrays of up to 1,000 elements or 'cells' – on the low side compared with other products.

The screen display consists of three lines at the top for messages, prompts and data entry, and down the right side the current level of menu options, the rest of the screen being occupied by the spreadsheet itself. This has row and column headings and the current cell is indicated in inverse video. With default field sizes this allows a 17 row by 5 column window on the data.

Working effectively with a spreadsheet is a creative activity so it is advisable to plan what is required in advance (a good example is presented in the very helpful manual). Having done this, making and using the spreadsheet is pretty straightforward.

A minor quibble here is that the commands are numbered from 1 to 144 (with a few gaps), which makes it difficult to remember them. Some of the more common ones are mentioned on



MemoPlan: compares favourably with Wordstar

to delete a record – I presume this is done by deleting the data in all fields. New records are added at the end of the worksheet.

Lists may be generated either by selection or sorting or both. Selection is done by specifying a field, an option (eg, equal, less than, between) and a value (or a pair of values if the option is 'between'). Lists may be merged, either by making an additional selection or by merging existing lists.

Sorting may be performed on the original worksheet or on a list generated from it, and it can be done on any number of fields in a record. Sorting is done in ascending sequence – there is no facility to sort in descending order. You can also select for one record on the worksheet. Your worksheet is displayed starting at the selected record, if found.

You can print out a dictionary giving full details of every worksheet and list.

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the function key overlay card but no use is made of the function keys themselves. They all appear in the list on the screen but I prefer alphabetic mnemonic codes.

Space does not permit me to go into all the options, but virtually all the facilities you'd expect of a good spreadsheet program are there somewhere. For instance, in data entry, you can enter actual values and extend them by row or column by a percentage growth rate or an incremental value (linear growth). Extensive mathematical and statistical operations are also provided, and these include growth rates, moving average, standard deviation and variance.

At first I had problems persuading graphs to appear on a monochrome monitor. Turning up brightness and contrast full gave a dim graph. A call to Acornsoft produced the answer: you have to specify 'no colour' when setting up the graph attributes. Once I'd done that some fine graphs were produced.

Indeed, the graphics available are very impressive. Three types of graphical output are provided: line graphs, bar charts and pie charts. The first two can be mixed on one display and bar charts can be adjacent or stacked, whichever suits the data being shown. Output can be to screen, a printer with dot graphic capabilities, or a plotter. If colour output is available up to three colours can be specified – green, red or blue. Up to six types of shading can be specified for bar or pie charts. Portions of a bar chart may be 'exploded' to stand out from the circle. The options provided are comprehensive.

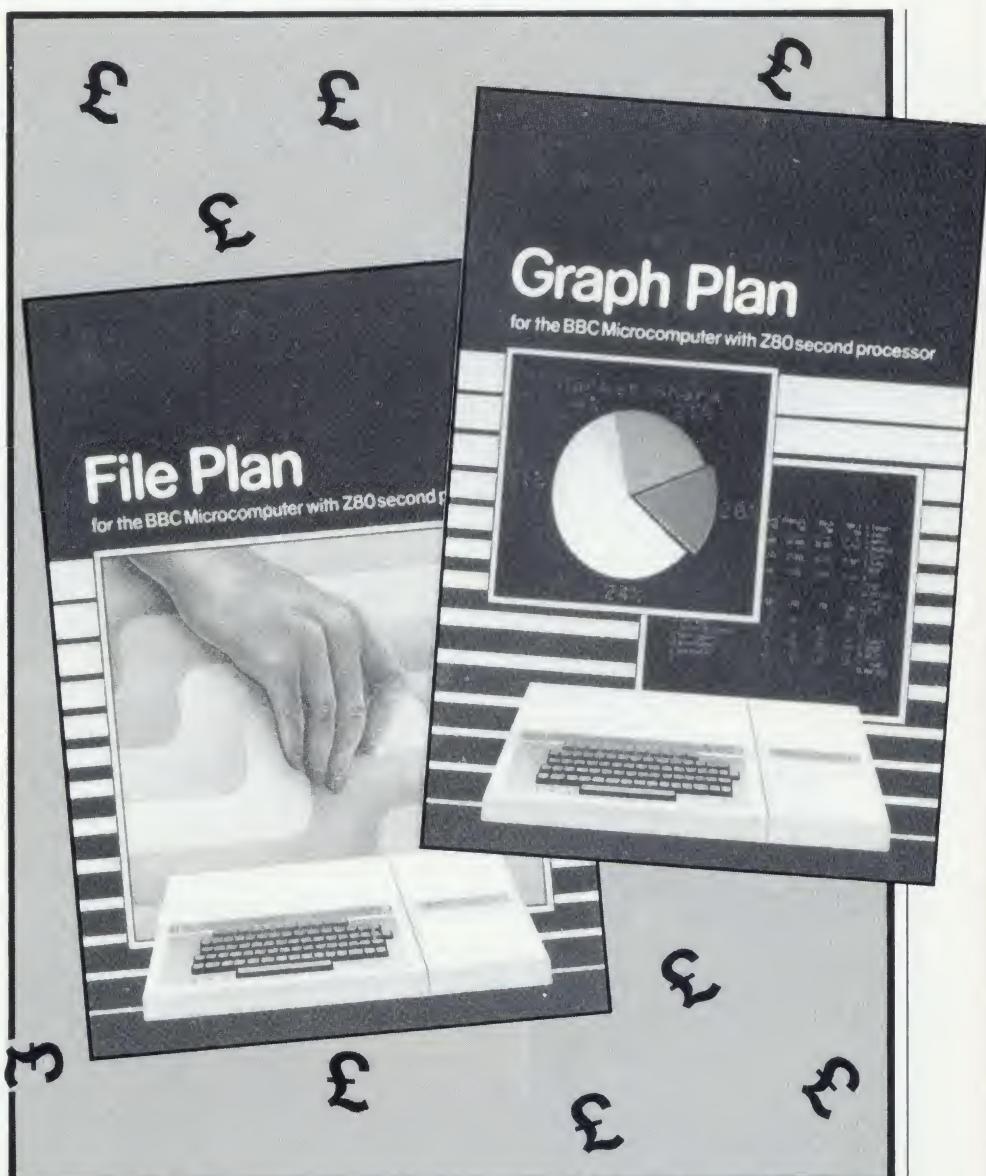
GraphPlan stands comparison with any of the similar packages available at around the £200 mark, apart from the maximum size of the array. It is fast at recalculation and the graphics are excellent.

Summary

This trio of Chang packages shows a consistent professionalism in implementation and documentation. *MemoPlan* is a capable wordprocessor with impressive features; *GraphPlan* is a good spreadsheet program with excellent graphics; and *FilePlan*, while not as outstanding as the others, is a perfectly adequate contender in its field.

If you upgrade your BBC micro into a business machine by adding the Z80 second processor, you'll be pleasantly surprised when you start using your 'free' software. It is of a quality you'd have been happy to pay for.

Next month: The Nucleus program generator and the program languages that are bundled with the Z80.



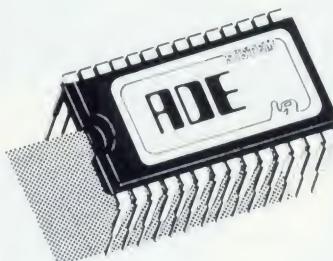
FilePlan: a database written in the form of a card-index system; **GraphPlan** provides three types of graphics



Diagram reproduced from the **MemoPlan** manual showing the function key strip booklet

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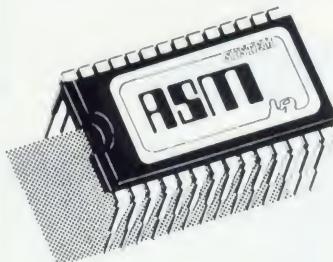
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The ASSEMBLER features macros with library facilities; nestable conditional assembly; flexible listing options (with or without macro expansion); hex, decimal, binary and ASCII data formats; dummy section; full range of arithmetic and logical operators; symbol table sort and dump; file chaining and 29 powerful pseudo ops. Source and object files are kept on disc so there is no limit on program size or location.

The EDITOR is designed with the programmer in mind for writing both programs and documentation. The editor includes a very powerful command language (including macros) that enables much editing to be done on a semi-automatic basis. It features full screen editing and deferred edit modes; no limit to document size; edit with backup facilities and a versatile text formatter.

The DEBUGGER is instantly accessible for inspecting, modifying and disassembling machine code programs. Features include full 64 byte display in hex, ASCII and disassembled format; registers; stack; single step; breakpoints; memory search and much more.

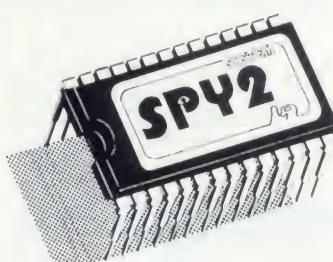
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SPY2 includes a set of powerful disc recovery commands for interrogating, editing and retrieving data stored on a floppy disc. SPY2 also includes a disc formatter as well as a non-destructive single track reformatter.

In all SPY2 has a comprehensive set of 23 utility commands. These are supported by an excellent Reference Manual.

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SPY2 features a versatile disassembler with hex dump, full and intelligent disassembly. This identifies data areas in the program; these being displayed as a hex/ASCII dump. Operating system calls are labelled creating very readable code. The powerful trace facilities enable program instructions and register contents to be traced to printer whilst the program is running. Indispensable for graphics programs as they can be stepped through whilst observing the effects on the screen.

SPY2 features a disc sector editor displaying the contents of a whole sector; disc search facilities for finding byte patterns or strings and free disc space. Files may be recovered by creating a directory entry with all the data concerning the deleted file. Directory entries can be easily amended using the *AMEND command. The *FORMAT command formats discs with any number of tracks. A verify command checks discs. The *REFORMAT command is extremely useful for recovering information from a bad track, reformatting it and restoring the data. Commands are included for loading files at &1900 and automatically downloading (and running) them.

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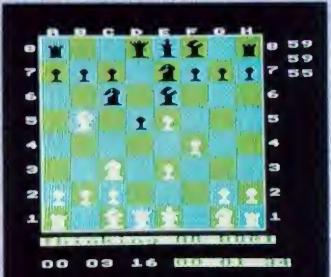
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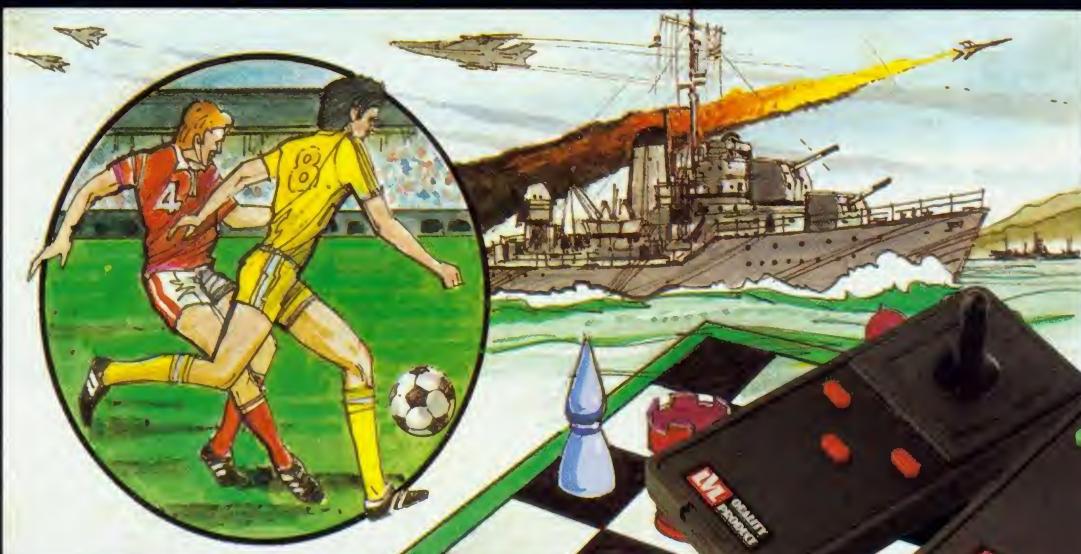
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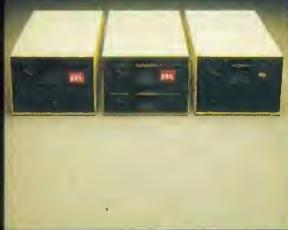
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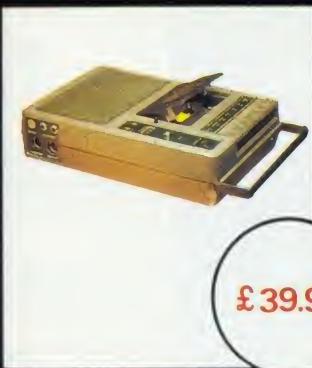


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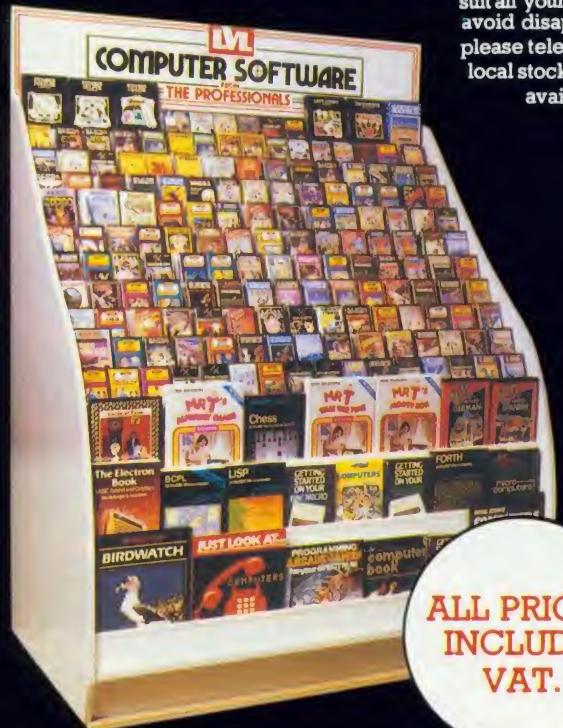
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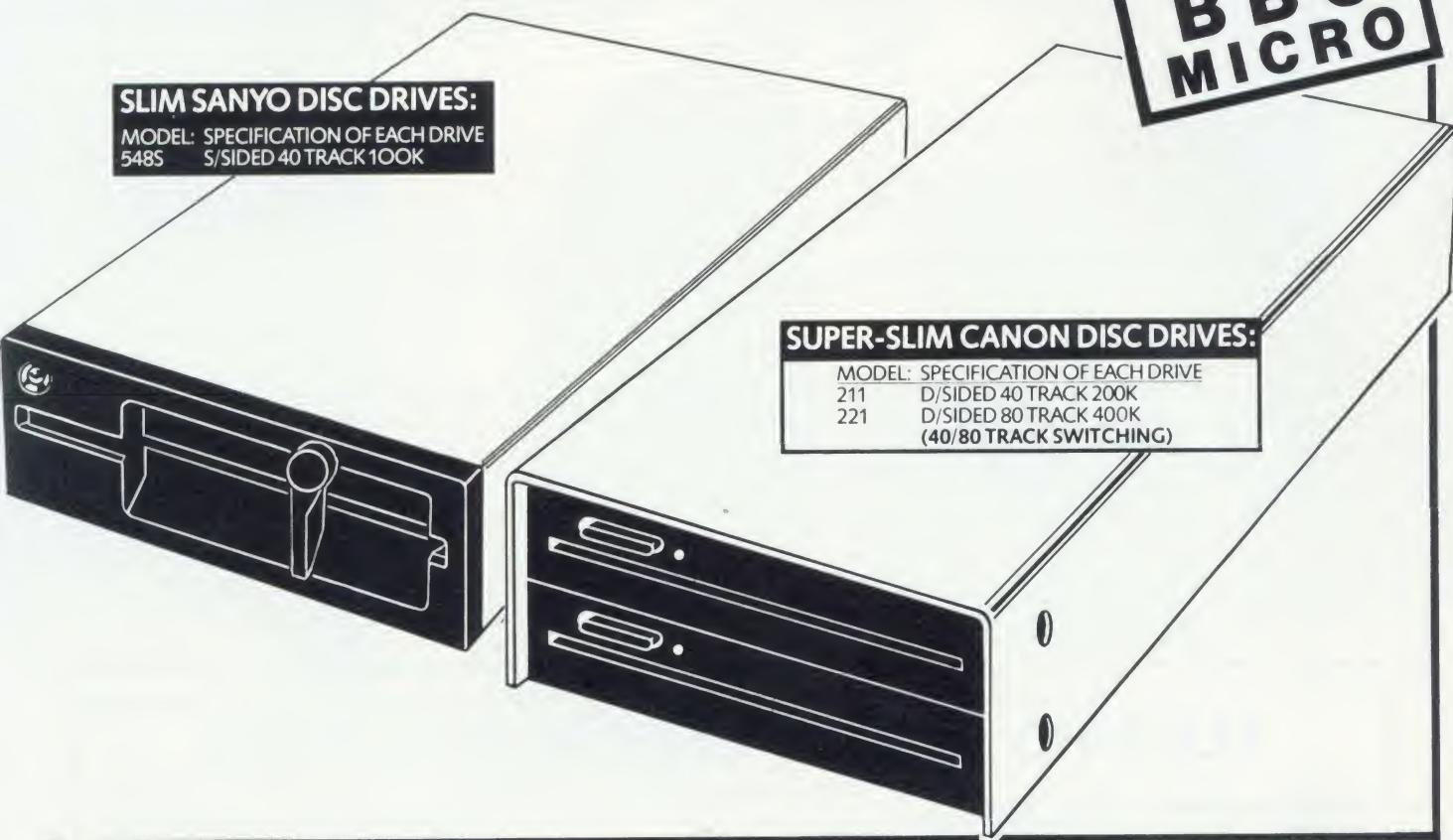
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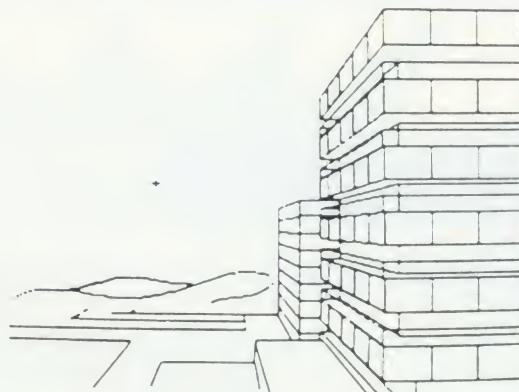
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There are three help menus on Toolstar which may be obtained by typing HELP TOOLS, 'HELP MCODE' or 'HELP EXTEND'. The third option menu will initially display the following:

'HELP EXTEND'

EXTEND - RAM adds... i.e. typing 'EXTEND < address >' will allow the user to extend the facilities of Toolstar with routines which are supplied by himself. The manual describes fully how this operation is carried out and illustrates it with several examples.

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TEACHING TODDLERS

104

Fun and learning for children as young as two with programs and micro overlays from Joe Telford



THE ideas and programs in this month's Jottings form an activity pack aimed at the youngest users. Toddlers, children in nursery or early primary classes should all be entranced, and six-year-olds too might find it interesting though many will already have keyboard skills in excess of this pack. The programs aim to get young infants playing with the computer, and give parents or teachers the chance to introduce and talk about the computer and related activities. Children will be introduced to basic concepts in shape, sound, pattern and colour, which, combined with discussion and guidance from adults, help develop reasoning skills.

The ideal way to use the pack is to allow children to work in small groups and explore each application—far better than a silent single child sitting in front of a computer. If a one-to-one situation does occur, the parent or teacher should spend time with the child, talking with and listening to that child's ideas and thoughts. This is where the value of this activity pack lies.

The programs are based around a number of activities, forming a larger program called *Yumap* (youngest user's micro activity pack). Although each section can be used by children, selection is best done by an adult, as an amount of reading is required. On chaining *Yumap* a menu page is shown which offers the choices:

1. Character patterns
2. Drawing shapes
3. Shape game
4. Drawing sound
5. Sketchpad
6. End program

Each section is described on pages 107 and 108, while the overlays for each are printed opposite and overleaf. The listings are on yellow pages xi-xiv, and on our listings cassette (see page 82).

Keys and colour

Whenever the break key is pressed the program ends, restarts, finds the correct section and returns to it. All that appears to have happened is that the screen has cleared. You might like to use this 'clear screen' facility by marking where the break key is found on each overlay.

The escape key has been reconfigured to act only when CTRL and @ are pressed together. This returns the program to the selection menu, and is sufficiently well hidden to prevent children from accidentally causing such an event.

In the three sections with coloured



crayon symbols, the current colour is indicated by a band at the top of the screen. If this band is not visible (in choices 2 and 5), the colour used is the background colour and rubbing out will take place.

Fitting the overlays

Each overlay can be coloured and

laminated or covered with transparent adhesive plastic to make it last. Before fitting an overlay, make a firm crease along the dotted line so that a strip of about one inch of overlay is folded downwards. Next fit the top strip of the overlay (containing its title) under the clear plastic function key holding band and adjust it to cover most of the keyboard. The part of the overlay already folded will now fall close to the front casing of the micro. Fit a large elastic band around the micro and trap this flap under it. The overlay should now be secure and ready for use.

Although any area of any panel can be used, it is best to actually press a figure as these are generally most central. An adult may need only one finger but small hands can also do the job.

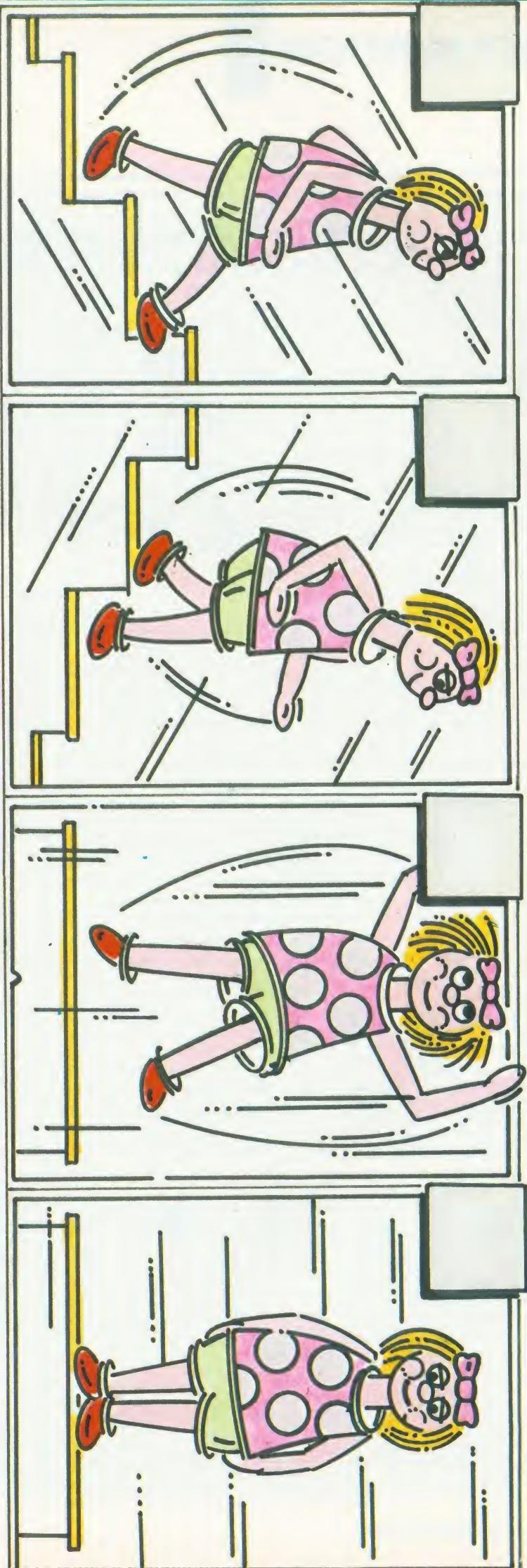
Inside the program

Figure 1 shows the main sections of the program, and the table of frequently used procedures shows these are split into two. The first group consists of graphics procedures for drawing triangles, rectangles and circles (see past Jottings). The second group includes two utilities, one for drawing a cross in the inverse screen colour and the second to make the areas of the keyboard match the areas of the overlays.

In the PROCsetup procedure one task is to allocate characters to a string array. Whenever the keyboard is pressed a character will be generated and placed into A\$ at line 1590. A\$ is then compared using INSTR\$ to each of the items in the string array 'Key\$()' and, depending on where it is found, a number is returned to the calling routine. This number is 0 if a key below the leftmost panel is pressed, 1 is generated by the next panel, 2 by the next, 3 by the rightmost panel and 4 by the space bar (colour panel). page 108►

DRAW SOUND - NOTE PLAYER

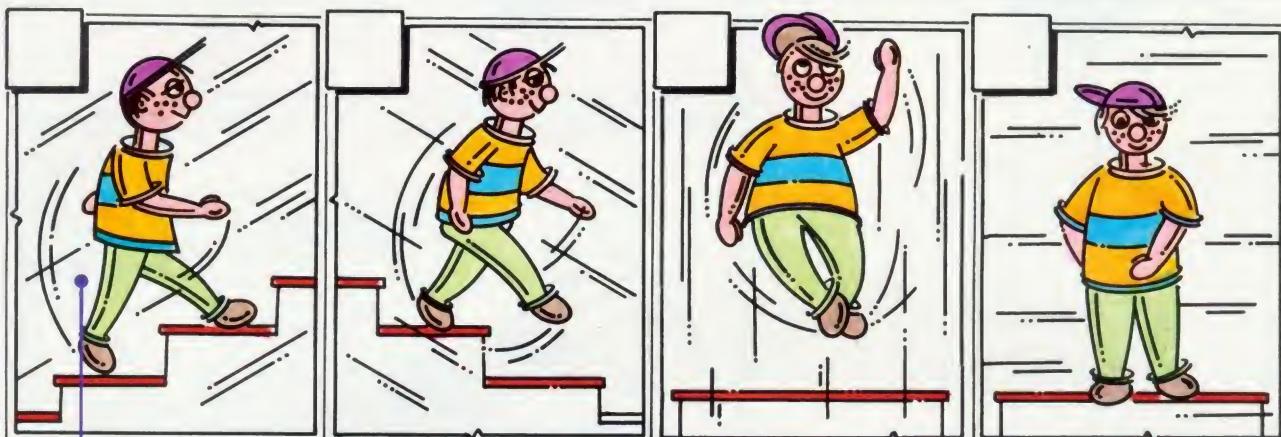
JOE'S JOTTINGS



Cut out this full-size keyboard overlay and use as guide for other shown reduced overlays!

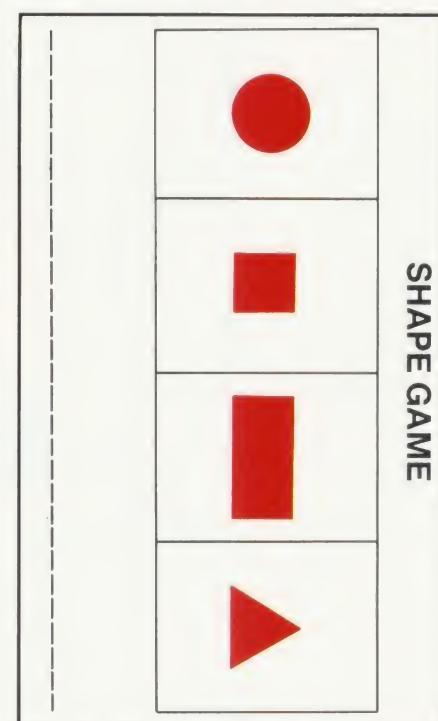
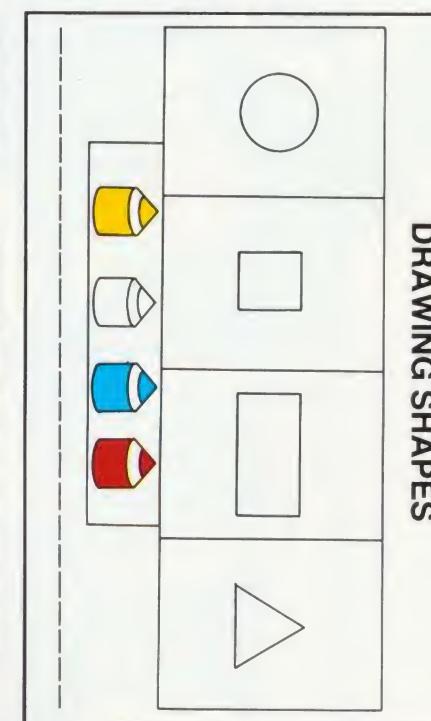
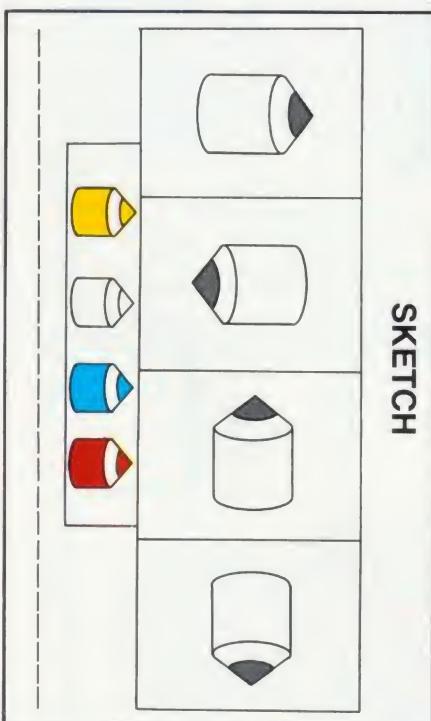
CHARACTER PATTERNS

106



- Stick to front of micro
- Covers space bar
- Fold over front edge of micro
- Main area fits over keys
- Slip under BBC's plastic strip or stick to Electron

Overleaf is a full-size overlay to use as a guide to making up the other four on this page: a great chance to get the felt pens out! Your child might like to use pictures of herself/himself on the overlays



1 Character patterns

On typing the number 1, a message appears which instructs the adult to attach a keyboard overlay to the computer (see instructions at the end of this article). In this case, the overlay to use is the one marked *Character patterns*, which contains pictures of four children in panels, plus drawings of three coloured pencils. Once fitted, a panel of the overlay can be pressed to start the character pattern section.

The screen now obeys the instructions given by pressing any of the panels. When the panel of the child walking upstairs is pressed, the pattern on the screen will move forward through a pattern sequence. This

sequence used consists of 123 items, including upper and lower case alphabets, numbers and graphic characters. After the last character the sequence will restart.

If the 'child walking downstairs' is pressed the characters will be displayed in reverse sequence. If the 'jumping child' is pressed, characters are displayed in random order, while the 'standing child' maintains the currently displayed character. At the beginning, the first character displayed (by pressing 'child standing') will be 'A'.

The colour of the characters is yellow at first, but pressing the fifth

panel showing the coloured pencils steps through yellow, white and red, then back to yellow.

The children can use this section to explore the relations between patterns, and parts of patterns, and to stimulate discussion about their findings. They will see discrete shapes, patterns formed by repetition of these shapes, and patterns which seem to merge together. Talk to them about heart or rocket shapes, stripy patterns and rows, lines or boxes. Children can then move on to practical pattern activities such as drawing, colouring, painting, sticking, mosaic-work or even potato printing.

2 Drawing shapes

On typing the number 2 at the menu, a message appears which asks the user to enter a delay time (between one and nine seconds) for the children using the program. To start, set it to nine seconds, then reduce it as the children get quicker. Next, a message instructs the adult to attach the overlay marked *Drawing shapes* which has four shapes in panels, plus four coloured pencils.

The start screen is blue and then a small cross appears, to the sound of a beep. This will move every nine seconds (or as per your setting), beeping as it does so. Children will

need to follow the cross, because that's where all the action occurs. Pressing any panel produces a shape of random size in the current crayon colour, and its position will be indicated by the cross on the screen. The four shapes are circle, square, oblong and triangle. The initial shape colour is yellow, but pressing the crayon panel steps the colours through yellow, white, blue (which rubs out) and red, then back to yellow. Shapes may be drawn on top of each other in any colour, though the cross and shape size move at random.

The shapes panel lets children

investigate and explore positioning and overlaying shapes, as well as the shapes themselves. Language is developed as the children describe what they have done and what they are about to do. Problems can be set, ranging from a simple 'Can you show me a circle?' to a more complex 'Can you put a red triangle between those two circles?' Matching exercises can also be performed, such as 'I have put three red circles on the screen. Can you show me the same number of yellow circles?' Children can develop other shape ideas, with or without the micro, using cut-outs and cards.

3 Shape game

Typing the number 3 at the menu results in a message to attach the keyboard overlay marked *Shape game*. Pressing any of the four shapes in panels starts the game. The screen clears to a purple background with a shape in the centre. This shape will have a random size, and the aim of the game is to make it vanish. This can only be done by the child recognising the shape and pressing the matching shape on the keyboard

overlay. If the wrong one is pressed, a hissing noise is heard, while a correct match gives a buzzing sound and the shape vanishes. Another shape takes its place and the game continues.

In this section variation in size adds to the interest, because the children have to realise (for example) that a square is a square no matter what size it takes. The random colour of any shape emphasises the fact that colour is not an attribute of any one

shape. Children might learn to recognise the simple shapes using this section, but without discussion and further practical work they will be learning without understanding. Follow-on work is closely related to that from the last section, though it would be particularly useful to allow the children to experiment: 'Can you make that oblong stand on end? It didn't when we used the computer. Is it still an oblong?'

4 Draw sound

Menu option 4 asks for the overlay marked *Draw sound-note player*. This has four human figures in panels, pressing any one starts the section and the screen turns blue and rectangles can be painted on the screen, each given a random colour. The height position of each rectangle on the screen indicates its pitch in a range of just over one octave. Adjacent rectangles are a semitone apart. Control over the sounds generated is by pressing a panel. The first panel shows a man walking upstairs and pressing this makes the note played go one semitone higher. After the

highest note the sequence will restart from the lowest note. The 'Man walking downstairs' plays the note one semitone lower. After the lowest note the sequence will restart from the highest note. If you press the jumping man, notes will play at random, and the man standing repeats the note played at the same pitch.

Whenever the screen is filled, it will automatically clear and the next note played will be displayed at the left of the screen, at the selected pitch.

The children can use this section to investigate informally the relationships between musical sounds. Much

adult input is needed because words like Up and Down, High and Low, Same or Different may all be introduced. Children can be set musical tasks, or be asked to set each other simple problems. For example 'Can you make the man walk upstairs?' or 'Can you make the sound go up three stairs then down 4?' or 'Can you make the sound of a police car?' Conventional musical instruments such as xylophones can take the explorations further, eg, 'Can you find that note on the xylophone?' Parents will soon find that many young infants do not find such tasks easy.

5 Sketch

On typing the number 5, a message appears which instructs the adult to attach the overlay marked *Sketch* which shows four pencils in different orientations, each in a single panel, and four crayons together in one panel. Press any panel to start and the screen clears to red with a cross in the

centre. This cross can be moved up, down, left and right by pressing the appropriate pencil. As the cross moves it leaves a line behind it in the current crayon colour. Pressing the colour panel changes the initial yellow through white, blue, red (for rubbing out) and back to yellow. This

section has an auto-repeat that allows the pencil to draw as long as a panel is held down.

The sketch routine gives children the chance to draw perfectly straight lines, and to build up shapes. Children can be asked to make bricks, boxes, nets, mazes and many other objects.

◀ page 104

If none of these panels is pressed -1 is returned.

The aim of PROCerror is to display any error in program execution. If the relocated escape key is pressed this procedure forces a rERUN.

PROCsetup does several house-keeping tasks. It sets up the function keys, the sections of the keyboard, the cursor keys, the initial 'crayon' colour, the relocation of the escape key, and a number of defined graphics used in PROCpattern.

The function FNmenu handles selection of any one of the five different sections available. It prints a menu, asks for input, then returns to the main body of the program with the number of the routine to call. PROCrusr turns the text cursor on and off. PROCend resets the cursor keys, and ends. After using this option to exit, function keys, etc, can be cleared by pressing the CTRL and BREAK keys together (CTRL-BREAK).

PROCPattern exists between lines 600 and 740. Input from the keyboard increments, decrements or randomises a pointer which indicates the ASCII value of current character to be displayed. The pattern is displayed by line 720. Once entered the procedure repeats until ESCAPE or CTRL-BREAK is hit.

PROCshape is found between lines 440 and 590. It draws a cross on the screen by referencing PROCrusr, then examines the keyboard for characters pressed. If none is pressed in the time limit set at line 490, the cross is moved at random and the process repeats. If, however, a panel is pressed, action is taken by calling one of the graphics procedures, or by incrementing the drawing colour.

In line 980 of PROCPattern, a shape is chosen at random and the choice routine from line 990 to 1020 draws the shape which mates the random number chosen. The procedure then loops until a keyboard panel is pressed at line 1050 and either hisses if the shape is incorrect (line 1060) or exits the loop (line 1070), buzzes and restarts the procedure (lines 1080, 1090).

PROCdrawsound is similar to PROC pattern in that an index (the variable 'choice') to a particular note is incre-



mented, decremented or randomised, then that note is played using the index as the basis of a simple formula (line 880). In line 900 another formula uses this index to position a rectangle on the screen to match the pitch of the note.

PROCskech is found between lines 280 and 410. PROCrusr is continually called upon to draw a cross on the screen. If any of the overlay panels are pressed, this is detected by FNkey and the IF...THEN statements between lines 350 and 390 take appropriate action. This procedure is in effect an infinite loop, from which return is only via the CTRL-@=relocated escape key.

Difficulties brought about by tiny fingers locating the break key can cause concern at first, but provided (as in this application) the stage of the section in use is not important, the problem is reduced to simply working out which section to restart. The approach taken here would not be able to maintain variables, or other data, and hence is only one step better than the well-known *KEY10 OLD!MRUN!M technique. Line 40 contains the key to the solution. If the

program is run, as it will be at first, K% is set at -1 and the break is set as:

*KEY 10 OLD! MGOTO50! M

with apologies to purists for the GOTO (I haven't had a good GOTO in ages).

This means that when BREAK is pressed the program restarts from line 50, hence W% and K% are not initialised. W% is simply the delay in seconds used in the drawshapes procedure, K%, however, is a pointer to the section of the program currently in use. If it is set to -1 the menu is accessed (line 80), otherwise the contents of K% are used to set the variable 'choice' which then selects the section to be executed. When a menu is called, the fact that 'choice' contains something other than 0 indicates that K% must be set to this value, and this is done at line 100. The result is simply that on running or using escape (CTRL-@) to rerun, the menu is invoked. Pressing the break key causes the program to skip the menu and use the section indicated by K%. The effect, to the user, is simply of the screen clearing.

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Rubber Band is a very flexible line drawing facility. Pictures can be saved and included in your own programs, very easily. GRAFDISK also provides a screen save facility. Recommended by BBC MICRO USER, PCN, ELECTRONICS & COMPUTING, LASERBUG etc, used by universities, colleges and business, as well as the enthusiast.

SINGLE KEY: (requires 1.2 OS) £5.00

SINGLE KEY ENTRY provides the user with single key entry of all 66 keywords on the BBC micro. Speeds up your program input, it's just like having 66 function keys and it only occupies 256 bytes. Compatible with BASIC 1 & Basic 2.

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UTILITY SOFTWARE



112 TIME FOR MICROS

Susan Kingsbury's activity board project brings day-trip fun to using the computer in class

PARENTS and teachers who have recently gained access to a BBC micro will no doubt be looking for imaginative ideas for its use. *Acorn User's* DIY activity board is a simple but effective device which, in conjunction with the computer, can be used in a variety of ways to foster both creativity and learning. Ideas for its use can come as readily from the children as from the teacher.

This article presents a program (listing 1, page XV) to operate with the board that, after typing into the computer and saving on tape, can be adapted by changing the data lines at the end.

The activity board can be built for a mere £12 or so. It is a simple structure consisting of a sheet of perspex (or, cheaper, hardboard or plywood) supported on four cottonreels. Underneath are switches wired to the BBC micro and these are activated individually by moving a magnetised object across the board. This simple arrangement is the

and so on for which toy animals are used. A small wooden toy, which we'll call Fred, with a magnet set into his underside, is moved around the zoo, stopping at places that take his interest. Each time he stops, an appropriate sentence, in double-height letters, appears on the screen. When Fred has seen all he wants to see, the pupil types P on the computer and the whole story of Fred's day at the zoo is displayed on the screen. If you have a printer, the story may be printed out at this stage too.

Fred is taken on his tour by a child, who is encouraged to read each new sentence as it appears. By the end the pupil will have written a story just by moving Fred around. In this way, the board could help to teach reading or provide incentive for slow readers.

Once everyone in the class is familiar with the idea, the pupils could devise their own scenario, such as a moon-landing or a race-track, draw the groundplan, make models for the stopping places and change the data lines at the end of the program to give appropriate sentences. Thus they could all be involved over a period of time.

In more detail, this is how the board functions. On the underside there's a reed switch (figure 1) at each stopping place. The reed becomes magnetised when Fred's magnet is positioned above it, the two halves of the reed attracting each other and the switch closing. When Fred moves away, the springiness of the reed opens the switch (figure 2).

Figure 1. Dry-reed relay switch

stage on which a variety of scenes can be enacted, with questions and prompts being channelled through the micro and displayed on its screen.

Imagine, for example, that on top of the board is placed a sheet of paper showing a groundplan of a zoo (see page 114). Mapped out are eight attractions such as a bear pit, a lion's cage

Soldered to the ends of the reed switches are wires which make up a cable connected to the BBC machine's user port. When a switch closes, a signal is sent along the cable to the computer and, under the control of the program, the appropriate sentence appears on its screen.

Making the board

You'll need eight dry-reed relay switches (see panel). Look at one of them from the side so that you can see the gap between the halves of the reed. Bring a magnet near to the switch and watch it close. You will hear a click as it does so, and another as it opens when the magnet is moved away.

Taking care not to break the glass at the ends of the switch, bend the wire at its ends to form legs at right angles to the switch (figure 3). Repeat this for all switches, then space them out on the underside of the board and tape them in position with the legs sticking out. You can glue them later.

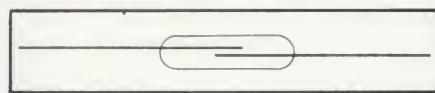


Figure 1. Dry-reed relay switch

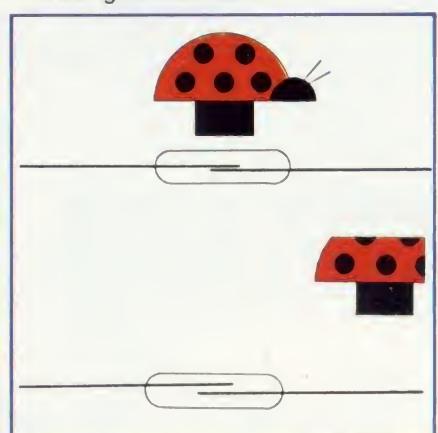


Figure 2. The magnet closes the switch as it passes overhead

The board is linked to the micro via a user port connector and a yard of ribbon cable (see panel). Bring the free end of the cable onto the underside of the board at one of the long edges (the board should measure 30 x 40 cm, the

size of an A3 sheet). Take enough cable to reach the furthest reed switch and separate the wires back to this point (we are not going to use all the wires and the first four, counting the red edge wire as number 1, can be kept together and taped out of the way). Secure the cable to the underside of the board near the long edge using Sellotape or insulating tape (see page 114).

Take wires 5 and 6 and trim them to a length that easily reaches your first switch. Strip about 2 cm of plastic from the ends of the wires. Wind the end of wire 5 around one leg of the switch and wire 6 round the other leg. Solder firmly in place. Label this switch 1.

Taking the rest of the wires in pairs – 7 and 8, 9 and 10 and so on – solder them to each of the reed switches, numbering the switches as you go, up to switch 8. The position of the switches is not important – the numbering merely enables you to relate each switch to its appropriate sentence. Tape any loose wires firmly to the board and make sure the cable is secured near the edge.

You'll find it helpful to stick a small label on the upper side of the board above each switch to mark its position, which you can check by moving Fred around and listening for the click of the switches closing. Stick four cotton reels on the corners to support the board, turn it the right way up – and away we go!

To check that all is working, plug the connector into the user port on the underside of the BBC machine, type in this little program:

```
10 PRINT 255-(?65120)
20 GOTO 10
```

and run it. At first you'll see a column of

zeros on the screen. Move Fred over switch 1 and the zeros should change to ones. Test all switches 1 to 8 and you should see the numbers 1, 2, 4, 8, 16, 32, 64 and 128. If necessary, adjust the positions of the switches to make sure they close when Fred is above them, and check your soldering.

Draw your zoo plan with the stopping places corresponding exactly to your switch positions. Add your toy animals, type in the Zoo program and Fred is ready to make his visit.

The program

The program begins with a note for the teacher and asks whether you wish to use the printer. Type Yes or No and press the space bar to continue. As Fred is moved around the zoo the sentence on the screen should correspond with the place he is visiting. Type P to

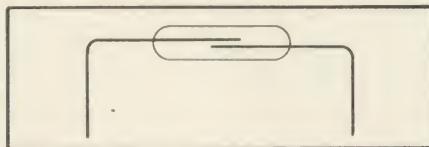


Figure 3. Reed switch with wire bent at angles

see your story on the screen and, if required, to have it printed out.

Listing 2 shows the notes for the teacher as they appear on the screen at the beginning of the program and listing 3 is the printout of Fred's visit to the zoo. He can, of course, pass the stopping places in any order.

To change the sentences to fit a new situation, change the data lines 690 to 770. Type your new title on line 690, followed by your eight new sentences. One important point – because of the double-height letters, the sentence must not be longer than one line. If you want single-height letters type line 500 as follows:

500 PRINT B\$(J)

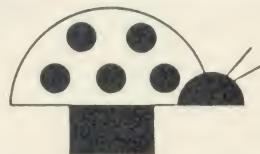
and line 560 as follows:

560 PRINT D\$(K)

and leave out line 570.

PROGRAM ANALYSIS

70,80	Dimension arrays – B\$ (number of sentences in data); D\$ (possible number of sentences in whole story)
90	Reads title from data
100-120	Reads sentences from data
130	Sets number of places visited to zero
140-280	Prints notes for adult on screen, and registers whether printer is required
290	Waits for space bar to be pressed before continuing
300	Clears screen and prints title in double-height letters
310	Checks whether Fred has set off
320	Clears screen
330-500	Scans user port to see whether Fred has arrived at a new place. If so, prints appropriate sentence on screen. L checks that he has left his previous stopping place and is not just moving about near it
340	Checks whether P has been typed on completion of visit. If so, program jumps to line 540 to display story
510	Adds 1 to number of places visited
520	Stores sentences in array for final display of whole story
530	Returns from sentence subroutine begun at line 400 to check for next place visited
540-580	Prints whole story on screen
590	If print-out not required program ends
600-680	Writes story to printer then program ends
690-770	Data



Parts list for Acorn User activity board

1 piece of perspex 30 × 40cm from local signwriter (or use plywood or hardboard)	£4.50
8 dry-reed relay switches @40p each from Radio Spares Components Ltd Form A, type 7-RSR-A, stock no 338-147	£3.20
1 User Port connector and 36in cable from Midwich Computer Company Ltd BBC22	£2.46
1 wooden animal with magnet attached from local toyshop	£0.35
Grand total	£10.51

Odds and ends

4 cotton reels
Toy animals or models made by pupils
Coloured sticky paper
Sheets of A3 paper
Clips for corners
Insulating tape or Sellotape

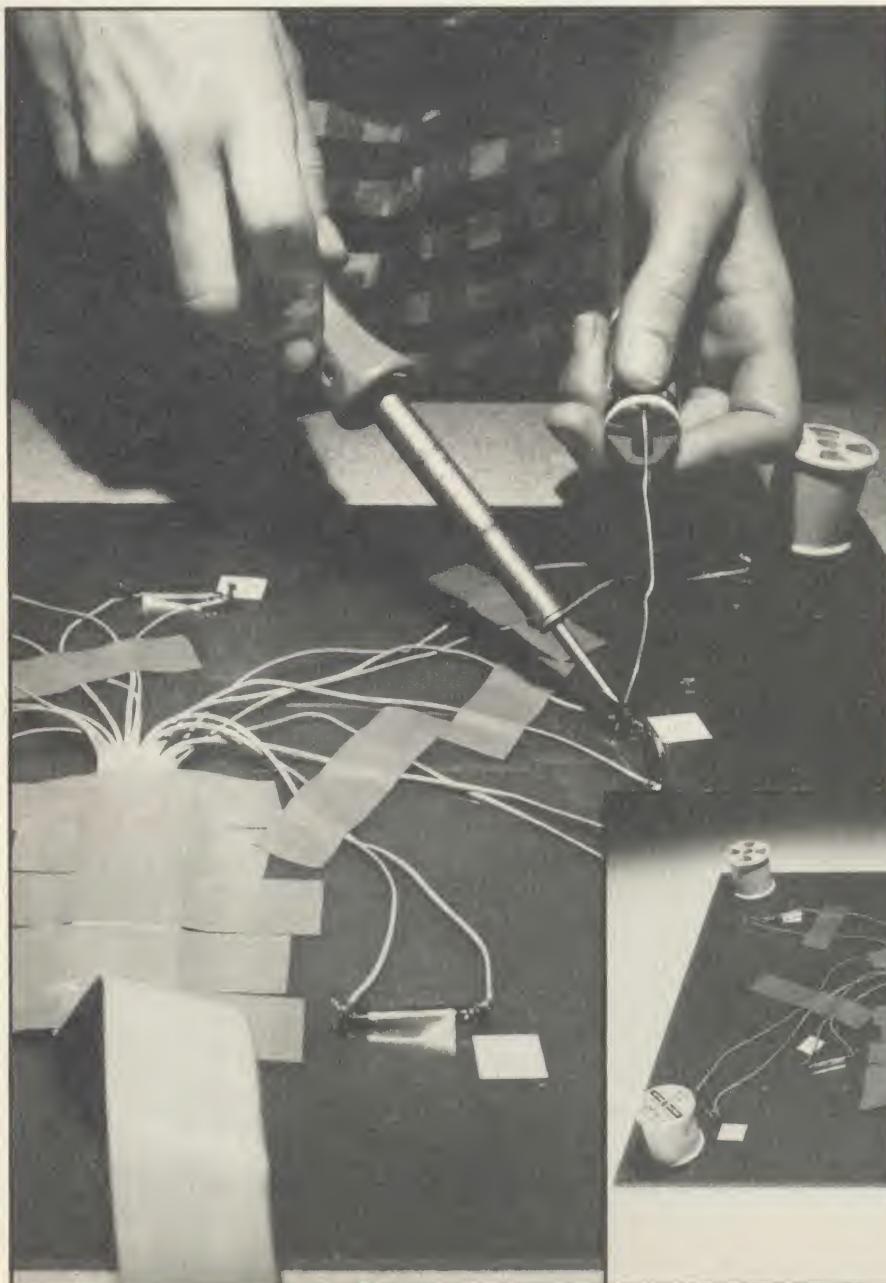
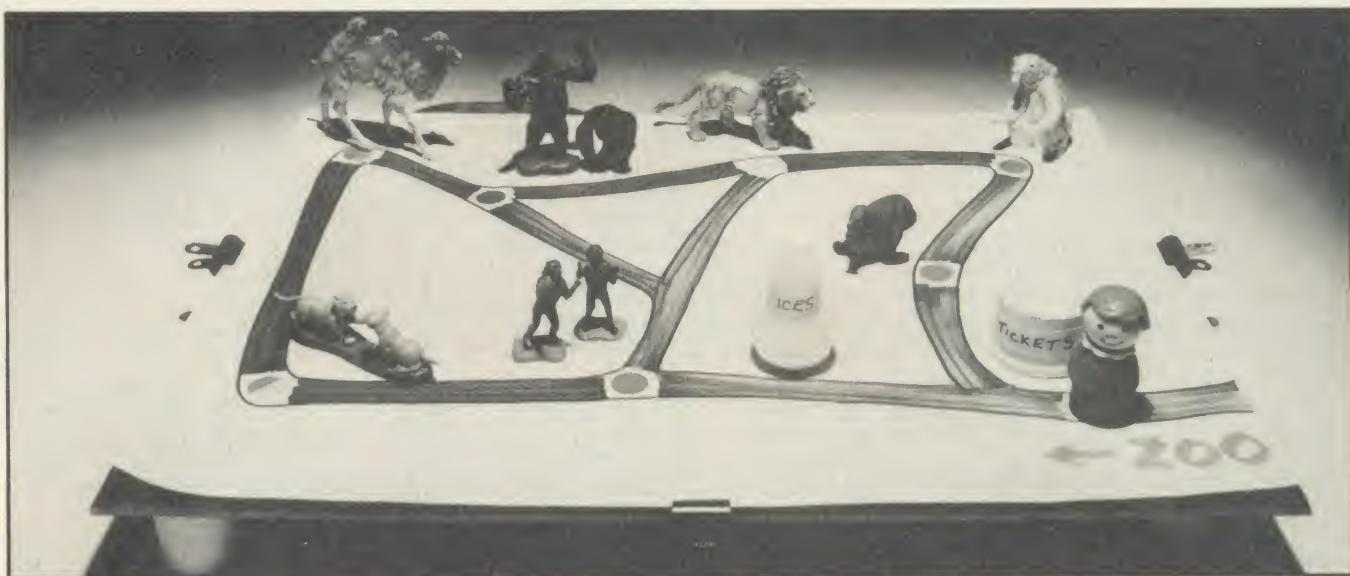
Tools

Soldering iron and solder
Wire-cutters and strippers

Addresses

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London EC2P 2HA

Midwich Computer Company Ltd
Rickinghall House
Hinderclay Road
Rickinghall
Suffolk IP22 1HH



BUILDING THE BOARD

ABOVE: The utility board set up as a zoo with a magnetised figure 'Fred' at the entrance. The order and position of the animals can be changed by varying the order of DATA statements in the listing. Obviously the overlays can be as simple or complicated as you want. All sorts of activities could be developed - theatres, museums, mazes, adventures etc, and the DATA can even include pictures.

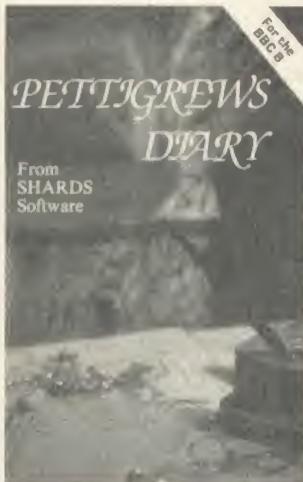
LEFT: Constructing the board. The reed switches are taped to the perspex, as are the wires. Note the cotton reels used as legs! In this picture one of the wires to the user port is being soldered onto a reed switch. Wires 1 to 4 have been trimmed back and are covered by the tape.

BELOW: The underside of the completed board. Note the position of the user port cable.

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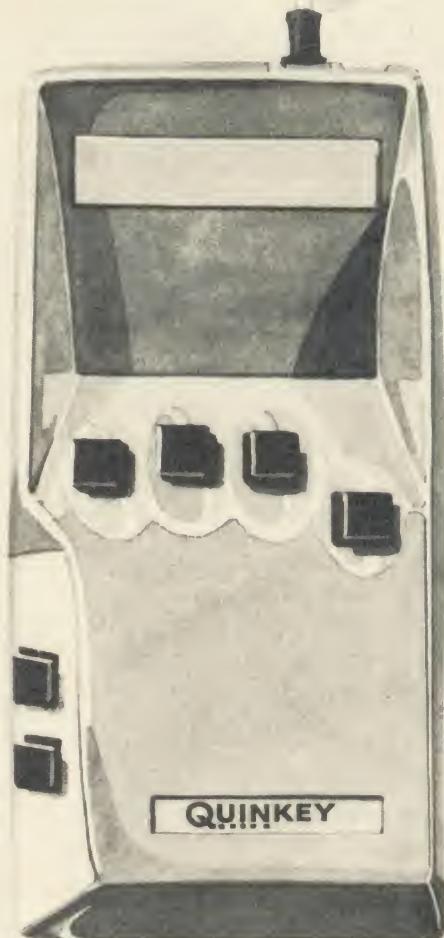
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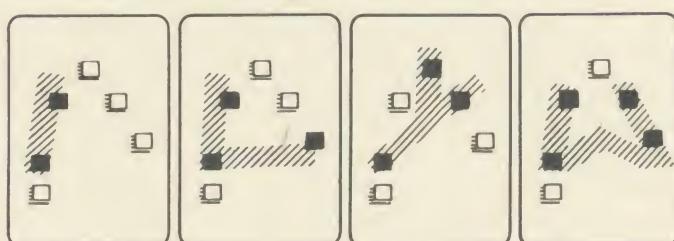
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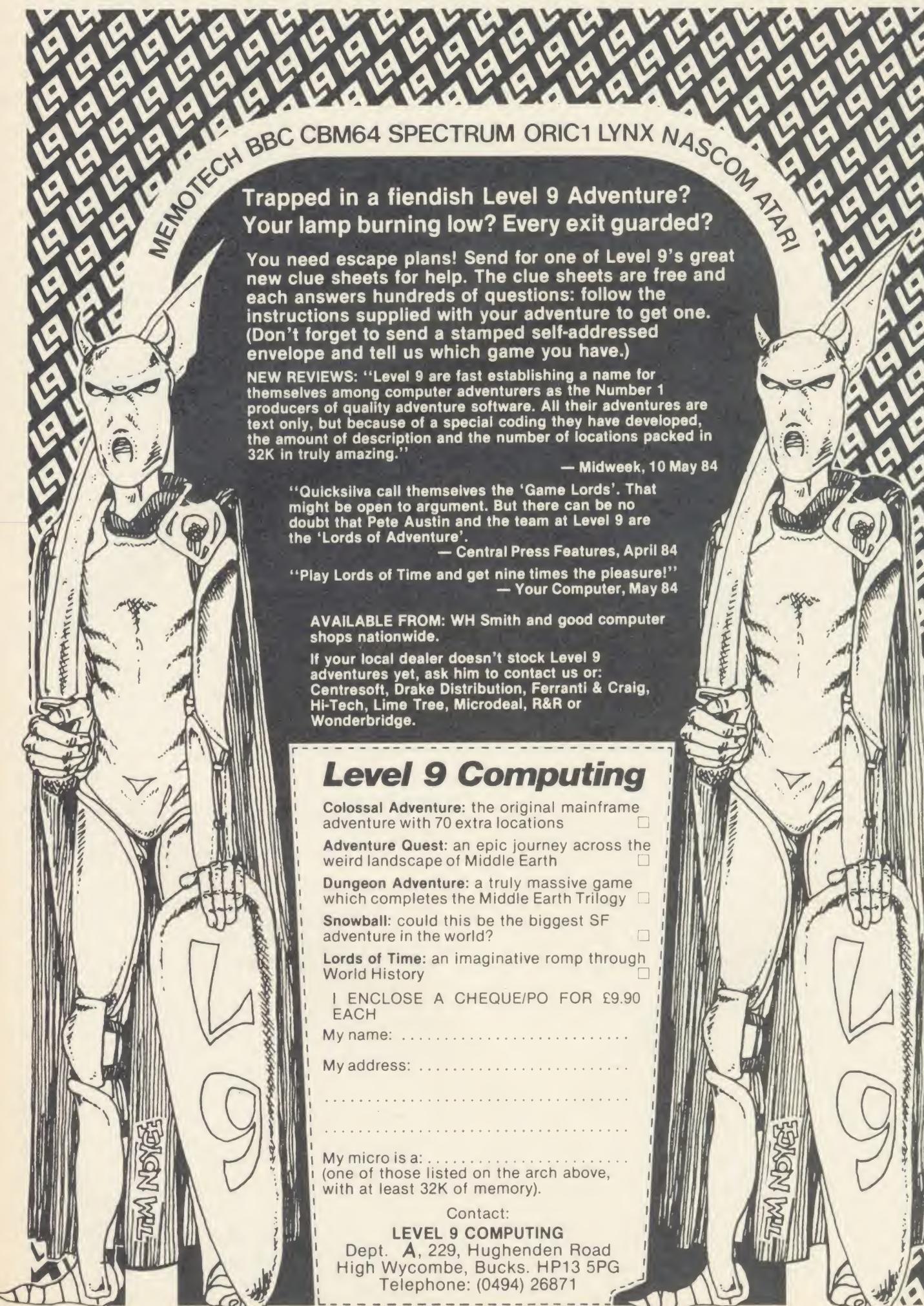
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A modular program for teletext display

LISTING 1 lets you create teletext-style displays on the Atom. The functions are set out in a menu and the program has been written in a modular style, so you can add to it. On selecting the CREATE option, you are presented with a blank screen – the screen number appears in the top left. You may move anywhere on the screen, using the cursor controls and return, and type your text wherever. The delete key functions as normal.

Once you are satisfied with the screen, press ESC, followed by any other key, to store the screen. Before storing, the cursor and the first two cells on the screen (where the screen number is) are deleted and they will not appear on the final display. Screens are stored sequentially from #8200 onwards, up to a maximum of ten. CREATE keeps track of the current screen number and attempting to create an eleventh screen will automatically route to the SAVE routine. In EDIT mode, the appropriate screen is displayed and you write/edit it just as you did in creating a screen, pressing ESC and another key to store it back in the correct place in memory. One difference is that the cursor will leave a mark at its initial position – this must be deleted by overwriting it with a space.

The DISPLAY option automatically rotates the selected number of screens and will continue until you press the CTRL key, to return you to the menu. The delay between screens can be altered and is on line 570.

You may save the screens created so far at any time, returning to the menu afterwards, but selecting the QUIT option automatically saves the screens (for safety) before ending.

The machine-code does the work of creating the screen, testing first for ESC (line 40), RETURN (line 50) and, if neither of these are found, jumping to

This month Barry Pickles turns his attention to teletext-style displays, extra codes for Epson printers and two screen dumps

121

```

5REM:      teletext
6REM: by Barry Pickles
7REM: (c)ACORN USER 1984
10DIMLL2:P=#2800;S=1
15F=0;@=2;P.$21;Z=#B001;[20:LL1 JSR#FFE3;RTS
30:LL2 JSR#FFF4
40:LLO JSR#FFE3;CMP@13
50    BEQ LL1;CMP@13
60    BNE LL2;JSR#FFED
70    JMP LLO;];P.$6
80aGOS.d;R=100*C;G.R
100 REM:LOAD TEXT
110 *LOAD"SCREENS"
120 G.a
200eREM:SAVE TEXT
210 E=#8200+(512*S)
220 *SAVE"SCREENS" 8200 E
230 IFF;@=8;END
240 G.a
300 REM: CREATE SCREEN
310 P.$12,S
320 LI.LLO;GOS.b
330 S=S+1;IFS>10;F=1;G.e
340 G.a
400 REM: EDIT SCREEN
410 IN."SCREEN NO."Q
420 E=#8000+(512*Q)
430 F.N=#8000 TO #8200 S.4
440 !N!=E;E=E+4;N.;LI.LLO
450 C=?#DF*256+?#DE+?#EO
460 ?C=32;E=#8000+(512*Q)
470 F.N=#8000 TO #8200 S.4
480 !E!=N;E=E+4;N.
490 G.a
500 REM: ROTATING DISPLAY
510 P.$12;IN."SCREENS 1 TO"Q
520cM=M+1;IFM=100;G.a
530 IFM>Q;M=1
540 E=#8000+(512*M)
550 F.N=#8000 TO #8200 S.4
560 !N!=E;E=E+4;N.N
570 F.D=1 TO 1000;WAIT
580 IF ?Z#40=0;D=1201;M=99
590 N.D;G.c
600 REM: END
610 F=1;G.e
700dREM:MENU
710 P.$12"           menu"
720 P." 1 - LOAD TAPE FILE"
730 P." 2 - SAVE TAPE FILE"
740 P." 3 - CREATE SCREEN "
750 P." 4 - EDIT SCREEN"
760 P." 5 - DISPLAY"
770 P." 6 - QUIT"
780 IN."SELECT OPTION"C
790 IFC<1 ORC>6;G.d
795 M=0;R.
800bREM: STORE SCREEN
810 C=?#DF*256+?#DE+?#EO
820 ?C=32;E=#8000+(512*S)
830 ?#8001=32;?#8002=32
840 F.N=#8000 TO #8200 S.4
850 !E!=N;E=E+4;N.
860 R.

```

Listing 1. Requires 1.5k text memory and at least 1k screen RAM

LL2 which echoes the keypress to the screen. The action of removing the cursor and screen number is in lines 810–830.

Code comments

FOLLOWING the list of undocumented 6502 op-codes in the June issue, several useful comments have been received. The first, from M Niman of Manchester points out that the code #9C performs the action: STZ absolute, X and not as stated in the article. Quite right, Mr Niman, I stand corrected! Mr Niman also asks me to point out that there are several versions of the 6502 and the undocumented codes are not necessarily compatible between each version. This may indeed be so and the same warning applies to all undocumented code. However, the codes were tested on the Rockwell and Synertek versions and found compatible.

It should be noted that the codes are

not compatible with the extended instruction set of the new CMOS 65C02 (the full instruction set details of this chip can be found in the October 1983 issue of *Elektor*). Finally, Mr Niman mentions the new chip from Western Digital, the 65SC816. This is the 8/16 bit version of the 6502 and is said to be fully pin-compatible.

Geoff Smith of Worcester Park suggests that op-code #AB loads the same immediate operand into A and X, setting bit 4 to 0. I've tested this a number of times, and the arithmetic results are not consistent. However, bit 4 is always set to 0, so perhaps someone will have a use for this code.

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Searching for compatible drive

MR A SULEIMAN of Wolverhampton asks which drives are compatible with the Atom. Well, the standard Atom DOS is configured for the Olivetti/Shugart-type drive, but it can, on request, be customised for the Tandon drives. I'm not sure about the new 3in drives, but I suspect they are also compatible, since they work on the Beeb.

You will need the Atom DOS and some extra memory, and the complete interface (needing only a drive unit) is available from Control Universal in Cambridge. However, I hear on the grapevine that CU is scrapping the original interface in favour of a double-density version, so have a word with them before buying a drive.

Finding the interpreter

RICHARD GATES of East Dereham wrote to tell me of a strange result obtained when he accidentally typed in P.CHRS(0) in direct mode. What he got was 94, which was the number of last error he produced.

After some experimenting, he found that P.CHA was equivalent to P.?A. However, he admitted defeat when trying P.CHA\$(0)?!

What Mr Gates discovered is the way that the interpreter works. The manual, you remember, tells you that, for most cases, spaces and brackets are not significant.

The interpreter works along a line from the left, until it encounters either an error or something it can interpret. As soon as it finds something meaningful, it stops, stores its position, and interprets the command/function, then carries on from where it left off. Now, you recall that a letter can be a variable or a pointer to an address, so, in the case of P.CHRS(0), the interpreter correctly interprets P., then moves on. The next thing it finds is CHR, which is a valid function, meaning the first character of \$R. Now it comes to \$(0). There was no comma separating the two, but the interpreter doesn't need one and \$(0) is again a valid function. Since location 0 holds the last error number, that is what is printed out. In the latter case, the interpreter reads the function as: P.CHA;P.\$(0?!)!

So there you are, Mr Gates. No bugs, just the interpreter not giving up unless it has to.

```

10 REM PRINTER CODES
20 ?40900=0
30 IN."STORE CODE AT "Q
40 DIM LL6;F.Z=0 TO 6;LLZ=$2000;N.Z;F.Z=0TO1;P=Q
50 P.$21
60<
70 LDA@LL0%256;STA$208;LDA@(LL0/256);STA$209
80 LDX@£60;STX£E7;JSR£AC4B
90 LDA@£20;STA$21C;LDA@£7F
100 STA$21D;LDA@£AC;STA$21E;LDA@£A2;STA$21F;LDA@£4;STA$220
110 LDA@£20;STA$221;LDA@£83
120 STA$222;LDA@£FB;STA$223;LDA@£60;STA$224
130 JMP£A03C
140:LL0 CMP@£2;BEQP+5;JMP£ACCE
150 LDA@LL1%256;STA$208;LDA@LL0/256;STA$209;LDA@2;JMP£ACCE
160:LL1 CMP@£3;BNEP+11
170 LDA@LL0%256;STA$208;LDA@LL0/256;STA$209;LDA@3;JMP£ACCE
180 CMP@£7E
190 BEQP+5;JMP£ACCE
200 LDA@LL2%256;STA$208;LDA@(LL2/256);STA$209;RTS
210:LL2 STXL3+B6;LDX@£FF
220 INX;CMPL3,X;BNEP-4
230 LDALL3+16,X;TAX;DEX
240 INX;LDALL3+32,X;BMIP+8
250 JSR£FEFB
260 JMPP-£9
270 LDA@(LL1%256);STA$208;LDA@(LL1/256);STA$209
280 LDXLL3+B6;RTS;:LL3;]
290 N.Z
300 A=LL3; !A=$64636261;A=A+4; !A=$68676665;A=A+4; !A=$6C6B6A69
310 A=A+4; !A=$706F6E6D
320A=LL3+16; !A=$0C080400;A=A+4; !A=$19161310;A=A+4
330 !A=$25221F1C;A=A+4; !A=$322F2B2B
340A=LL3+32; !A=$80012D1B;A=A+4; !A=$80002D1B
350 A=A+4; !A=$8001531B;A=A+4; !A=$8000531B;A=A+4
360 !A=$1B80541B;A=A+4; !A=$461B8045;A=A+4
370 !A=$80471B80;A=A+4; !A=$1B80481B;A=A+4; !A=$141B800E
380 A=A+4; !A=$800F1B80;A=A+4; !A=$1B80121B;A=A+4
390 !A=$1B801241;A=A+4; !A=$401B8032;A=A+4; ?A=$80
400 P.$6
410 ?£20A=$1C; ?£20B=$02
415 LINK Q
420 E.

```

Listing 2. P McArdle's Wordpack patch

Wordpack patching to provide

extra codes for Epson printers

LISTING 2 comes from P McArdle of Galway and is a patch for *Wordpack* users, giving extra codes for Epson printer functions. Unlike other *Wordpack* codes, these may be used anywhere in a line, but they will be counted as characters for justification purposes. The codes are held in a look-up table, beginning on line 300 and they may be altered to suit other printers. Used with *Wordpack*, you will need extra RAM to store the assembled code. The listing assumes RAM from #2000 and the vector set at the end of line 100 and the start of line 110 should point to Q+4. Those who use the new Bearsoft *Editor* may assemble the code at #2800 and must also alter the JMP on line 130 to #A01B.

The codes are each output using two characters. The only special character which may not be used for any other purpose in the text is ^ [shift ^]. This character is followed by a code letter:

a underline

b cancel underline

'c	subscript
'd	superscript
'e	cancel super/sub-script
'f	emphasised print
'g	cancel emphasised print
'h	double print
'i	cancel double print
'j	big print return cancels
'k	cancel big print
'l	small print
'm	cancel small print
'n	double line spacing
'o	normal line spacing
'p	initialise printer

The program has the following properties. The code it compiles occupies less than 256 bytes. This is placed at the address requested at the start of the program. If RAM is available below #2800 then use it; if not, be careful not to overwrite it. Line 20 is a ROM switch command: if you need one put it here. The program debounces the Atom's keyboard. If you do not want this, delete lines 90 to 120 and line 410.

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Star modifications for screen dump

A SCREEN dump for the Epson MX80 by Chris Shepherd of London is given in listing 3. It is enabled by LINK #xxxx, where xxxx is the start of the machine-code. It can be modified for the Star

range of printers by deleting line 570, then rewriting the following lines:

```
310LDA@76;JSR#FEFB  
610LDA@140:JSR#FEFB
```

```
100 REM GRAPHICS DUMP  
110 REM C.A.SHEPHERD  
120 REM  
130 P.$12;DIMLL10  
140 P."ASSEMBLE TO";  
IN."(E.G. #3B00) "Q  
150 P."LIST";IN."  
(1=YES, 0=NO) "L  
160F.I=0TO10;LLI=Q;N.  
170P.$21  
180F.I=0TO1  
190P=Q  
200L  
210:LL0 LDA @2  
220JSR#FEFB  
230LDA@#FF;STA #8A  
240LDA@#7F1 STA #81  
250LDA@#E0;STA #80  
260LDA@0;STA #8D  
270LDX@#3F1;STX #BB  
280:LL1 LDY@0  
290STY#89  
300LDA@27;JSR #FEFB  
310LDA@75;JSR #FEFB  
320LDA@00;JSR #FEFB  
330LDA@#01;JSR #FEFB  
340:LL2 LDX @7  
350 CLC  
360:LL3 LDA (#80),Y  
370STA #81,X  
380TYA  
390ADC@#20  
400TAY  
410DEX  
420BNE LL3  
430LDY@8  
440:LL4 LDX@7  
450:LL5 ASL #81,X  
460ROL A  
470DEX;BNE LL5
```

```
480AND #8B  
490AND #8A  
500JSR #FF10  
510 DEY  
520BNE LL4  
530INC#89  
540LDY#89  
550CPY@32  
560BNE LL2  
570LDA@#FF;STA #8B  
580LDA@27;JSR#FEFB  
590LDA@74;JSR#FEFB  
600LDA@20;JSR#FEFB  
610LDA@224  
620CLC  
630ADC #80;STA#80;LDA@0  
640ADC #81;STA #81  
650INC#8D  
660LDA#8D  
670CMP@27  
680BMI LL6  
690BNE LL7  
700LDA@#70  
710STA#8A  
720:LL6 JMP LL1  
730:LL7 LDA @3;JSR #FEFB  
740RTS  
750J  
760IFL P.$6  
770N.  
780@=4  
790P.$6' "OCCUPIES #&Q" TO #&P'  
800 E.  
810 REM  
820 REM A GRAPHICS DUMP IS  
830 REM OBTAINED BY INSERTING  
840 REM THE COMMAND, LINK#XXXX  
850 REM WHERE XXXX IS THE  
860 REM ASSEMBLED CODE START  
870 REM ADDRESS IN HEX.
```

Listing 3. Chris Shepherd's program for Epson printers

```
90REM PROGRAM TO PRINT THE £ SIGN ON THE AP100A.  
1000DIMLL1:F.I=1TO2:P=#3D0  
110C:PHA:LDA@#FF;STA#B802:LDA#B80B:ORA@2:STA#B80B  
120PLA:PHA:CMPO@#5C:BNE LL0:PLA:LDA@#B9:PHA  
130:LL0 AND@#80:BEQ LL1:LDA@1  
140:LL1 STA#B800:PLA:JMP#FE52:J  
150N.I:END
```

Listing 4. Curing an almost universal problem

```
995REM:Subroutine for  
996REM:Daisystep 2000  
997REM:screen dump on  
998REM:the Acorn Atom  
999REM:@B.Pickles - 1984  
1000dP.$21$2;REM:screen off  
1009REM: horizontal spacing  
1010P.$27$31;A=4;LI.#FF10  
1019REM: vertical spacing  
1020P.$27$30;A=2;LI.#FF10  
1030P.$27$78;V=#2800  
1039REM: bit mask  
1040!V=#10204080;V!4=#10204080  
1050F.Y=191TO0S.-1  
1060F.X=0TO255
```

```
1069REM: convert x/y to address  
1070P=X/8+(191-Y)*32+#8000  
1079REM: test point at x/y  
1080Q=(?P&(V2(X&7))>>0)  
1090IFQ;P.".":G.b;REM: set  
1100P." ";REM: not set  
1110bN.;P.';N.  
1119REM: back to normal  
1120P.$27$26$73$3$6;R.
```

Listing 5. Daisystep 2000 screen dump

Programming

for printing



the pound

NEXT is a short routine (listing 4) from Abe Ellis of Chelmsford. This solves the almost universal complaint that printers insist on printing a # sign, instead of the £ sign. The program is quite simple and the listing to assemble the code into spare space at #3D0 is shown. Before use it is necessary to change the vector as follows:

?#209=3;?#208=#D0

The keyboard 'backslash' (#5C) is used for the £ sign, but this can be any keyboard character.

So the printer can accept an eight-bit word, bit 7 must be connected to the Atom printer plug, pin 9. This is done using port B, bit 0 of the 6522. Accordingly, pin 10 of IC1 is wired to PL5 pin 9.

Line 110 of the program initialises port B of the 6522. Line 120 looks for the #5C code and changes it to #B9, which is the code used by the AP100A for '£'. Line 130 checks if the msb of the character is a '1' which includes all other special characters in the AP100A. Line 140 sets port B, bit 0 to a '0' or a '1' as required.

The Basic print statement can now be used normally. The symbol which appears on the screen is a graphics symbol but this need not concern us. It must be remembered that if break is pressed the #208/#209 vector must be re-entered as #3D0.

Unfortunately, when the Acornsoft Wordprocessor ROM is entered, the printer vector is re-initialised and there is no way of breaking into the program to correct this. However, I have overcome this as follows.

Assemble the program normally, then enter the wordprocessor and complete all editing. To print out the text it is necessary to enter Basic using 'Q'. Now the vector can be corrected to #3D0 as before, followed by LINK#ACF7 when the printer will print the text.

Problems with

the Daisystep

LISTING 5 provides screen dump programs for the Daisystep 2000 printer.

Next month's Atom Forum will contain screen dumps for the Seikosha and the Centronics 737/739. This should now cover all the popular makes.

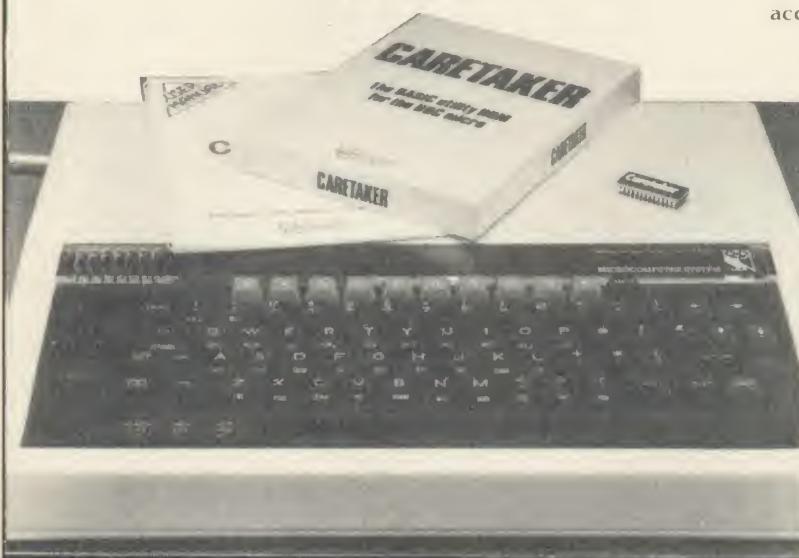


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EXPAND <start> <end>
INSERT <fsp> <lineno>
KEYLOAD <fsp>
KEYSAVE <fsp>
LVAR <F><I><S><A><P>
MOVE <address>
MERGE <fsp> <fsp>...
NORMALKEY
NOTAB
PARTSAVE <fsp> <start> <end>
RENUMBER <list> <inc> <start> <end>
RETRIEVE <bytes>
SINGLEKEY
SQUASH <S><R><M>
STATUS
TABSTOPS <columns...>
```

OS 1.20
>

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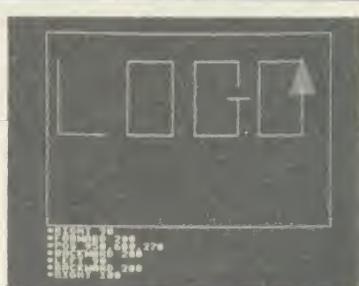


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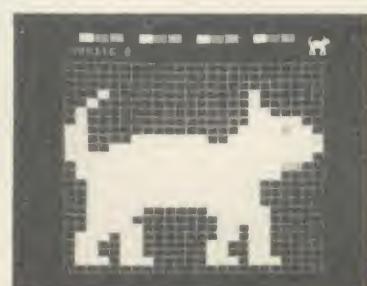
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AVOIDING INVALID DATA ENTRY.



Most coders have their own system for error-trapping.

Vincent Fojut examines a common INPUT problem which can sometimes trap the unwary user

127

WHEN writing programs, especially for use by others, it is important to cater for invalid data entry, whether deliberate or accidental. The practice is often referred to, somewhat unkindly, as 'idiot-proofing' or 'mug-trapping'. Most coders will have a few routines to detect the more obvious errors, but it is often difficult to foresee all possible causes of 'misinterpretation'. A perfect example is that the operation of AtomBasic's INPUT command can itself trap the unwary.

On the Atom, 'INPUT' works like 'INPUT LINE . . .' on the BBC/Electron. That is, anything entered in response to INPUT's prompt, including leading spaces, is passed to Basic for evaluation. With numeric data entry this is not a problem, since Atom's expression evaluator will skip leading spaces until a suitable number, variable or expression is encountered. However, when inputting strings, confusion can arise.

Try running the following simple program on your Atom:

```
10 R = #3000
20 INPUT "AGAIN (YES/NO)" $R
30 IF $R = "YES" THEN RUN
40 END
```

Enter 'YES' immediately after the prompt and the program will run again. The second time, enter a couple of spaces before typing in 'YES', and see what happens. On a Beeb or Electron, the program would continue to run. However, on the Atom it stops.

In other words, INPUT on the BBC (without the LINE option) automatically left-justifies any string entered – that is, it removes leading spaces. Atom's INPUT does not do this, which can be disconcerting for the inexperienced user, who may be hard-pressed to see any fault in the apparently correct data entered. Fortunately, it is a simple

matter to implement the required left-justification facility. Both Basic and machine-code solutions are provided herewith.

Program 1 shows a few simple Basic subroutine variations to eliminate leading spaces. In all cases, variable X points to the string to be left-justified, and should be set up before the subroutine call.

Version (a), written 'in full' for clarity, works in the following way:

If the first character in the string is not a space, then the string must already be left-justified, in which case the routine exits immediately. Otherwise, each character of the string is examined in turn, until a non-space char. is found. Once detected, the string starting from the first non-space char. is moved down to the string's original starting address. In this way, unwanted spaces are eradicated.

Version (b) and (c) employ subtly different coding from the original, in an attempt to make the routine as compact as possible. Since version (b) does not use an IF statement, the whole code can be fitted on one line. The only processing overhead is that even if the string is already left-justified, the 'string-move' code is still executed, ie, it 'moves' to where it already is!

In (c), the code drops through to the second line (a RETURN statement) if the first character in the string is not a space. If it is, the whole string (starting at the original address + 1) is repeatedly shunted one byte downwards, until the first char. is not a space. This is obviously slower if there are many leading spaces. For example, 10 spaces means that the entire string is moved 10 times. On the plus side, this variant is the shortest of the three, and uses only one Basic variable, not two.

To see the routines in practice, modify the earlier program thus:

```
10 R = #3000
20 INPUT "AGAIN (YES/NO)" $R
30 X = R; REM X POINTS TO STRING
      "R"
40 GOSUB J; REM CALL
      LEFT-JUSTIFIER
50 IF $R = "YES" THEN RUN
60 END
```

You should now be able to reply to the prompt either with or without leading spaces.

Providing the correct response is entered (ie, 'YES') the program will always re-run.

Program 2 is a functionally similar program written in machine-code. As before, the Basic variable X is made to point to the string to be analysed, before calling the routine with the LINK command. To try it out, assemble the machine-code at, say #2800 and change line 40 in the previous program example so that 'GOSUB j' becomes 'LINK #2800'.

The program uses two zero-page locations as a string pointer, and once these are set up, the processing is as per version (a) of the Basic routines.

It should be noted that these programs are not limited to use with Atom's INPUT routine. They can be employed in any situation where strings need left-justifying – for example, formatting data in tabular form.

Of course, there's a good deal more to error-trapping than one could cover adequately in an article. But the routines outlined here go one more step towards eliminating the unexpected, and make robust, reliable code a little more easily attainable. If your strings no longer match on input, you can rest assured that it isn't due to spurious spaces.

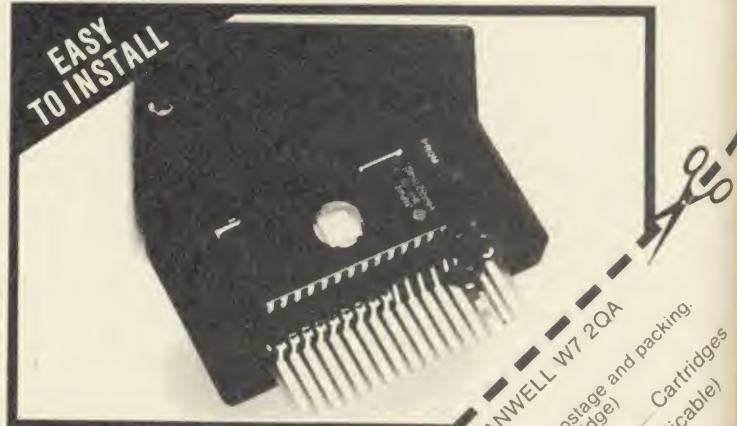
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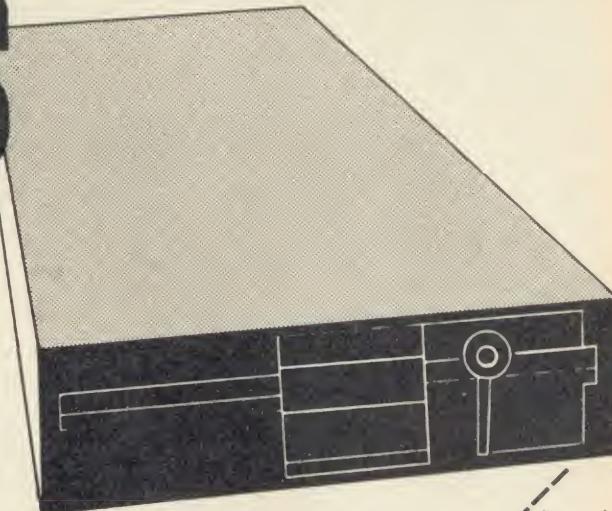
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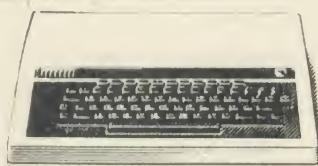


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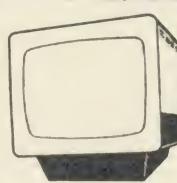
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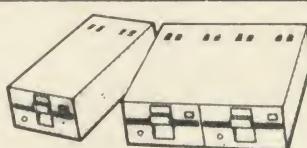
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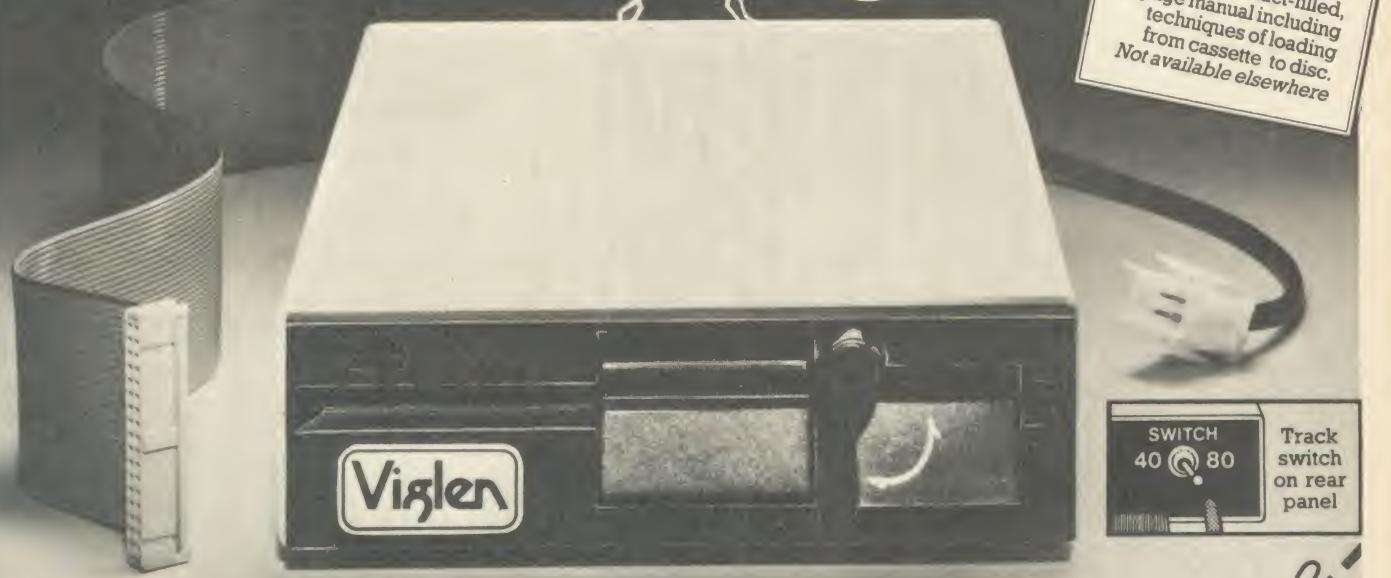
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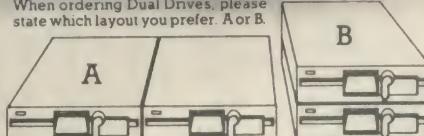
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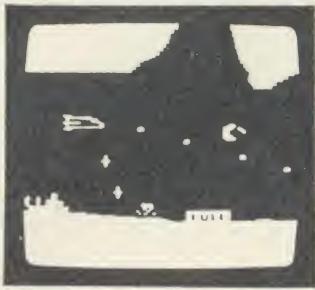
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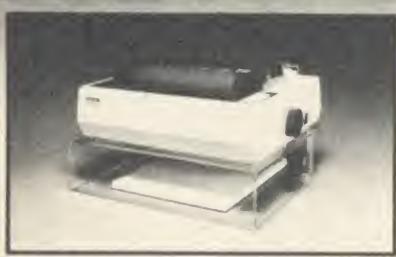
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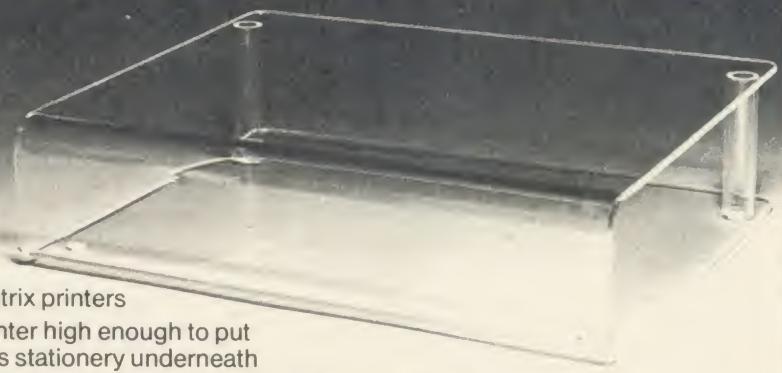


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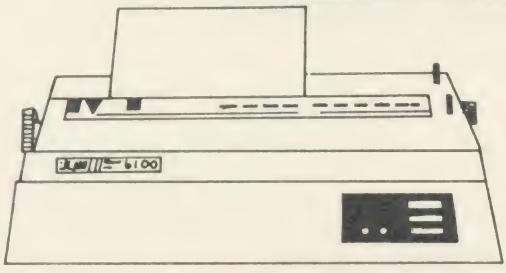
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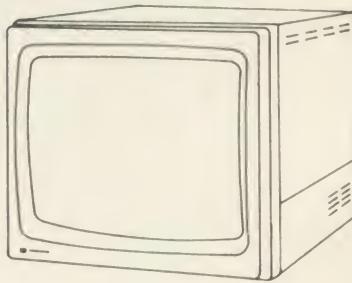


AU 8/6

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AU8/8

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SOFTWARE CHART

TITLE	PUBLISHER	PRICE	MICRO
1 (9) Fortress	Amcom	£8.95	B
2 (1) Snooker	Visions	£8.95	B/E
3 (10) 737 Flight Simulator	Salamander	£9.95	B/E
4 (3) White Knight II	BBCSoft	£10.00	B
5 (2) Twin-Kingdom Valley	Bug-Byte	£9.50	B
6 (16) Daredevil Denis	Visions	£8.95	B
7 (7) Chukkie Egg	A&F	£7.90	B/E
8 (17) Lords of Time	Level 9	£9.90	B
9 (18) Cylon Attack	A&F	£7.90	B/E
10 (6) The Hobbit	Melbourne	£14.95	B
11 (5) Hopper	Acornsoft	£9.95	B/E
12 (—) Battletank	Superior	£7.95	B
13 (8) Hunchback	Superior	£7.95 (£11.95)	B
14 (—) Mr Wimpey	Ocean	£6.90	B
15 (14) Gorph	Dr Soft	£8.95	B
16 (—) Eagle's Wing	Software Invasion	£7.95	B
17 (—) Pengwyn	Postern	£6.95	B/E
18 (20) Transistor's Revenge	Softspot	£7.95	B
19 (19) Dodgy Dealer	OI Consultants	£6.50	B
20 (15) Snapper	Acornsoft	£9.95	B/E

B = BBC E = Electron Prices in brackets are for disc version

BUBBLING UNDER

Confrontation (Lothlorien)
 Aviator (Acornsoft)
 JCB Digger (Acornsoft)
 Cosmic Kidnap (Superior)

Compiled by RAM/Computer

Jet-Power Jack (Program Power)
 Chemical Analysis (Acornsoft)
 Hulk (Adventure International)
 Fruity Fred (Softspot)

THE pace for this month's chart is being set by Amcom's *Fortress* which has cannoned *Snooker* from Visions into second spot. No new Top Ten entries again this month though Superior's *Battle Tank* has blasted its way into number 12. Another new entry is *Mr Wimpey* from Ocean, while *Pengwyn* and *Eagle's Wing* have flown into the number 17 and 16 spots respectively.

Snapper after two years of chart fame is tottering

on the edge of the chart at number 20. Will it stay or be gobbled up by a new entry?

The highest chart climber this month is Evil Knievel's protégé *Daredevil Denis* who rides up ten places to number 6.

Bubbling under from the last issue still are *Aviator*, *Hulk* (we still haven't seen a copy), *Jet Power Jack* and Acornsoft's new earthmover *JCB Digger*, reviewed in July and June respectively.

SOFT OPTIONS

RE-SITTING English literature O Level again this Christmas? Then you might be interested in three new pieces of study software for the Beeb and Elk: Shakespeare's *Macbeth*, *Romeo and Juliet* and *The Merchant of Venice*. Each allows you to follow your own line of questioning, delving into the lover's secrets (is this *Dallas* in disguise?) or who killed who (yes it is!). The programs prompt you in the correct line of questioning and full act and scene references are provided.

Gsoft is providing *Multi-base*, a text editor and a key definier/character generator from its 18 Melbourne Road, London, E17 address. *Multi-base* allows you to use the one main program to create and manipulate a variety of multi files to be used for phone numbers, indexing etc, which can be dumped to a printer or saved on tape or disc. *Text Editor* enables you to write text to the screen which can be edited and printed as required. *Key Definer* sets up each of the function keys with a number of useful utilities to complement your programming techniques, while *Character Definer* is another in the increasingly large range of VDU23 editors.

For those who can't spell, *Spellwise* is the third checking programs for use with Computer Concept's *Wordwise*. With 6000 words in its vocabulary it should cover most of your needs! Contact Dataware, Freepost, Swindon SN3 4BR for more details (write carefully!).

If you've read all the assembly language books around, the *Complete Machine Code Tutor* from New Generation Software is a cassette-based machine code tuition package. The two cassettes contain 27 lessons aimed at trial and error learning. New Generation is at The Bookands, 15 Sunnybank, Lyncombe Vale, Bath, BA2 4NA.

Apart from all that, things are fairly quiet on the new software front, with many software houses saving up their fares for the Acorn User Exhibition.



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BBC HARDWARE FACTS**UNDER ONE COVER**

'A Hardware Guide for the BBC Microcomputer', Wise-Owl Publications, Hull Innovation Centre, Guildhall Road, Hull, HU1 1HJ, £11.95 (inc VAT) plus £1.50 p&p

This book has 253 A4 size pages, which sounds a lot, but you should be aware that 136 pages are simply re-prints of manufacturers' IC data sheets. The remaining 117 pages are reproduced from a computer printout done on a daisywheel printer, but using a fairly large text format. This means that there are about 400–500 words per page. The following summary gives an idea of the contents of each chapter, plus some indication of its length.

Chapter 1 (five pages) is a general introduction giving an overview of the BBC microcomputer system as a whole. The aim of the book, it says, is to give 'a detailed understanding of the internal workings of the BBC micro'.

Chapter 2 (six pages) is entitled 'Attitudes to work and disciplines required'. It conveys some general ideas of the technical skills needed if you want to start playing with the hardware: how to handle ICs that might be damaged by static, and information on how to solder, de-solder and de-flux PCBs.

Chapter 3 (23 pages), which contains a 'complete description of the circuitry', is where the real meat of the book begins. This number of pages may seem ample space to describe the circuit, but it is an extremely complex machine, and in places the description is a little superficial. Also, the last six pages of the chapter deal with the use and applications of the 1MHz bus.

Chapter 4 (21 pages) is a very full survey of the link selections. The first four pages explain how to remove the main PCB and re-assemble it and give a warning about breaking warranty by doing soldering on the board. I was interested to see that the authors have been unable to find out what link S7 really does. While writing the new service manual I spent some time asking engineers at Acorn what it was for, and no-one there knew either. (Anyone got any ideas?)

There is one notable omission, presumably accidental. When talking about link S23 the reader is referred to the data sheet for the 88LS120 (RS423 driver IC), which it says is included in the book – unfortunately it's not there.

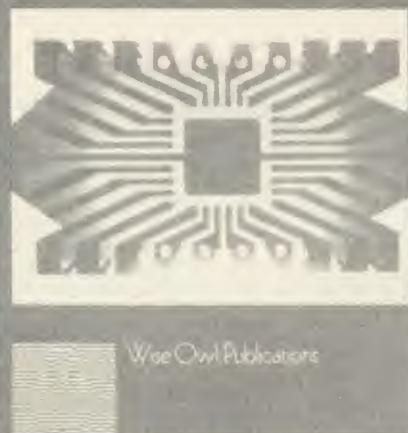
Chapter 5 contains 34 pages of detailed information about how to upgrade the machine from A to B, how to add the disc, Econet and speech inter-

faces, and some indication about adding second processors.

An interlude between chapters 5 and 6 consists of four full-page photographs of the computer indicating the positions of various ICs, fixing screws and so on.

Chapter 6, 'Hints, tips and modifications' (13 pages) contains many ideas which, on the authors' own admission, have been published elsewhere. Nevertheless, it makes a useful compilation. The chapter contains a section about the analogue port which has a number of mistakes. The pin numbering of the plug is incorrect in two of the diagrams, and it gives a method of supposed over-voltage protection which, in certain circumstances, would not only fail to protect the chip but would blow the protecting devices – LEDs. This is because they have forgotten to

A Hardware Guide For The BBC Microcomputer.



put current limiting resistors in series with each input – 1000 ohms would do.

There are one or two other omissions, apart from the lack of the 88LS120 data sheet. The first is that, except for the cassette interface, no circuit diagram is provided. This reduces the value of the circuit description. Acorn would not give permission for Wise-Owl Publications to reproduce the diagram (despite the fact that it had already been released to the general public in the *Advanced User Guide*). The other omission is that although the preface refers to 'system fault-finding', there seems to be no more than a passing reference to this in the text.

There's quite a lot of useful information in this book, and generally speaking it is of a good technical standard. It is also helpful to have all the datasheets in the one document, but the real question is whether or not it is worth the money (£13.45 inc p&p). Owners of the *Advanced User Guide*



may feel it is not since they already have a link selection survey and a limited description of the hardware. In general though this is a useful text, if a little over-priced.

Paul Beverley

● Wise-Owl has accepted the criticisms in this review and agreed to correct the various errors which were pointed out to them.

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LITTLE DEPTH**FOR TEACHERS**

'BBC Micro in Education', Eric Deeson, Shiva Publishing, £6.50

AS THE BBC is the most important computer in schools, there is a need for a book written specifically for teachers detailing some of the possible classroom applications. Mr Deeson's book is not it.

The first chapter asks the inevitable question 'What is a computer?' and in a couple of pages swiftly disposes of bytes, CPUs, ROMs, and RAMs – all never to be mentioned again, so why bother in the first place? It also features a feeble drawing of a BBC, monitor and tape recorder sitting on a desk-top – in case you didn't know what such things looked like.

Next we get a Basic programming tutorial from first principles and I mean first principles – for example, 'Press RETURN after each line'. Very laudable, but a bit out of place in this book. Then comes a section on applications – Prestel, wordprocessing and the like, which again is disposed of very quickly.

And so the book continues, jumping from one subject to another and not really covering anything in sufficient depth. The best chapter is the one on graphics, nicely combining program listings with typical applications of computer graphics – CAD, plotters, etc. The worst is on flowcharts and 'top-down programming'.

Throughout the book, Mr Deeson adopts a rather juvenile style: do

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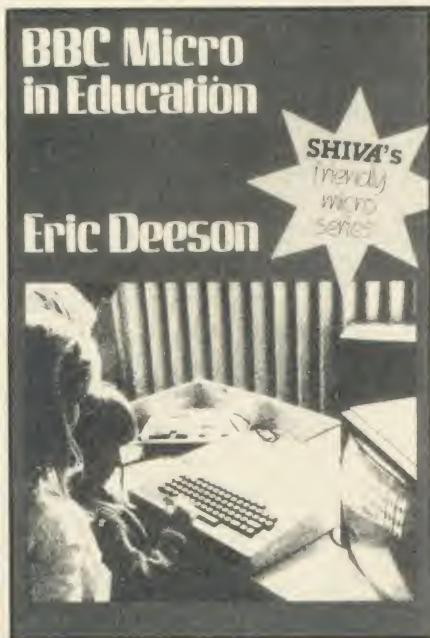
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people actually call the BBC a 'Beebox', and do we really need cartoon drawings of 'bugs' in a book aimed at teachers? In his previous book, *Easy Programming for the BBC Micro*, this device worked well, but here it gets a bit tiresome. In fact, that was a much better book for the newcomer to the BBC, and indeed several chunks from it have found their way into this new book.

The book aims to do too much: teach



the novice Basic programming, cover the many applications of computers, and act as a resource book for teachers. In 170 pages it cannot hope to succeed. Where it would be useful is as a guide to writing educational programs – a very specialised field.

The book contains some useful programs and routines for error-trapping, 'user-friendliness' and easy-to-read instructions, and as such would be invaluable to a teacher who already knows BBC Basic and wants to write his or her own educational software.

Memo to Shiva Publishing: why not call the book *Educational Programming for the BBC Micro* and lose a few of the cartoons?

Geoff Nairn

BASIC ASSEMBLER

'Assembly Language Programming on the Electron' by John Ferguson & Tony Shaw, Addison-Wesley Publishing, 197 pages, £7.95

JOHN FERGUSON and Tony Shaw need no introduction to Acorn User readers and this latest book is written in their usual thorough but easy-going style. Basically a rewrite of their book for the Beeb, it is aimed squarely at the newcomer to machine-code.

The first two chapters explain how the computer works at machine-level, and the next three introduce the assembler at its simplest level, followed by a summary. Chapters 6-10 go on to more complex functions, again followed by a summary. Chapter 11 brings the whole thing together, chapter 12 deals with interrupt handling, and chapter 13 rounds off by showing the stages in developing a complete program – a text editor, in this case. The book ends with set of useful appendices and an index. Throughout there are example programs, diagrams and cartoons.

The book contains one or two small mistakes, but nothing worth worrying about. Two things I would like to have seen are a note about 'modulus' effects, when indexing with the X and Y registers, and a note about the 'bug' common to all 6502 processors, which can cause indirect jumps to be incorrectly handled. These are, however, minor criticisms and I commend this book to anyone (not just Electron users) who wants an easy introduction to machine code.

Barry Pickles

DATABASE GEM

'Databases in the Classroom', Derrick Daines, Castle House Publications, £6.95

A WHOLE book for databases in the classroom? That might be the first reaction of most teachers to this book's title, if not indeed 'What's a database?' So some words of explanation are called for: Logo, simulation programs and other educational software are all very well in the classroom, but it is not how children will use computers when they grow up. Boring it may be, but most computers process data – vast quantities of it – held in things called databases. So it's important that tomorrow's generation should know something about how databases work.

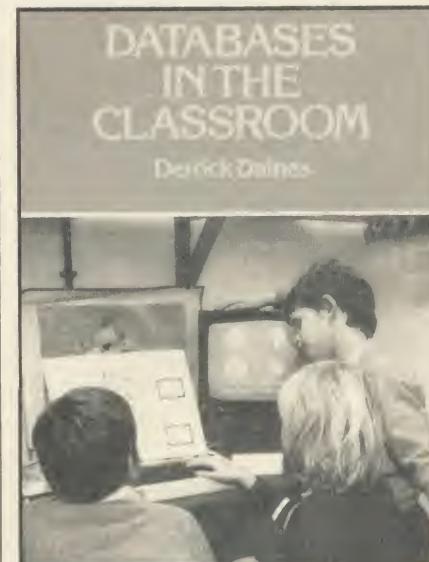
The scene is set in the first chapter for today's information society and how it has arisen. As illustration, the story is told of how IBM, the world's largest computer company, grew out of a competition held by the US Government when it could no longer cope with the sheer quantity of census data. This deluge of data doesn't trouble just governments; anyone who has got lost inside the Prestel database will recognise the problem. Today it is no longer a question of what you know but rather knowing how to find out. This skill is something we should all acquire and the process should begin at school. This is Derick Daines' argument and the basis for his book.

Subsequent chapters cover the tech-

nology of databases and data management: storage media, serial and random access, bubble sorts and the like. To the novice the jargon can be daunting, but here the author introduces buzzwords only when needed.

Being aimed at teachers, the book contains several practical exercises to work through with schoolchildren, using both manual and computer methods. A simple manual system is described which uses punched cards and knitting needles to store and retrieve information on pupils – height, age, number of sisters and brothers, etc. As an example of a computerised system, the database programs in the Microprimer software pack and their possible applications are described. As this software is available free to primary schools, it makes sense to base the examples on this rather than on an expensive machine-specific commercial program.

As if writing a book wasn't enough,



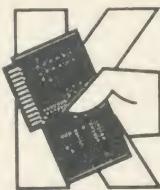
Mr Daines has also written his own database program for the BBC micro and a listing of this appears on the back pages. Written in Basic, it is nevertheless quite sophisticated, allowing up to 1000 records and using both serial and random access methods. Typing in long, dense listings is not everyone's idea of fun, so the program is broken down into separate sections, with accompanying text explaining exactly how each section works. This means it can easily be altered to suit your own needs. At £6.95 the book is worth buying for the database program alone!

Overall, an excellent book which covers a subject not normally dealt with in most schools. If you are a teacher using a BBC micro and you want to give your kids a taste of how computers are used in the real world, this is the book for you.

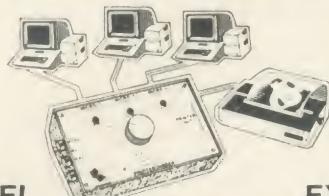
Geoff Nairn

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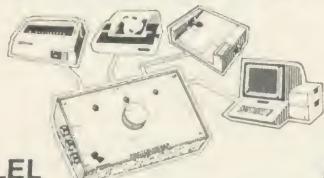
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OILY CHOICE

'Slick!', BP Educational Service (01-920 8985), BBC A or B, tape £18 (education price £11.95).

WHEN it comes to their public image, no-one is more sensitive, or tries harder, than the multi-national oil companies. Tigers, free tumblers and sponsored art exhibitions have all been used to clean up the image of what is inherently a dirty product. BP bring the idea bang up to date with *Slick!*, a 'conservation game' for the BBC micro, in which the object is to minimise the effects of an oil slick at sea.

You are Mr McTaggart, the local pollution officer for a small Scottish fishing village, with £5,000 to spend on anti-pollution methods. On the screen is a map of the harbour and the surrounding area, with the oil slick shown as an ominous black blob moving inexorably



towards the shore. Also shown are the shellfish beds, fisheries and beaches – which, above all, oil should not reach.

The game has two parts: first you decide which anti-pollution method to spend your money on – absorption, sinking, dispersant or shore-cleaning; then the action proper starts. After the oil spill has been announced, the current position of the slick is shown as a map reference, eg, (590,370). You then have to calculate its next position from the speed and direction of the prevailing wind. For example, a 'fresh breeze from the east' will blow the slick three squares to the west. If you guess right, and within the time limit, you can load up a tug with your chosen anti-pollution material and head off for the slick,

moving the tug with the arrow keys.

The above process has to be done in several stages, but once you've reached the slick, you can start unloading the material and so reduce the size of the slick. In addition, you can position static booms across sensitive spots such as the harbour; unfortunately you can't see them on the screen – they appear just as map co-ordinates.

And so the game continues until, inevitably, oil reaches the shore. You are then scored on how successfully you dealt with the slick: from a base score of 50, points are added for correctly predicting the slick's path and protecting the harbour, but are deducted according to how much reaches the shore.

Here one must question BP's objectivity: for example, letting the oil come ashore loses points because, as the guide lets slip, oiled beaches get reported in the press. Similarly, shellfish contaminated with dispersant chemicals don't improve BP's image.

The final section in the user guide, entitled 'Point of Exercise', is perhaps the most telling: 'Nobody wants oil pollution. But we all need oil... Accidents will happen'. Oh yes?

Incidentally, with all the current talk of software pirates bankrupting the industry and the devious devices adopted to prevent it, the attitude of BP in this respect must seem puzzling, if not embarrassing. Not only are you encouraged to make back-up copies, but there is even an option in the main menu of *Slick!* that automatically transfers the program to disc for you!

As a piece of educational software *Slick!* teaches a variety of skills, from decision-making to map-reading and grid references. The danger is in thinking that a poor score means that you 'lost' – it just means that you didn't choose the method that BP wanted you to choose. Perhaps the Friends of the Earth should bring out an alternative version of *Slick!*

Geoff Nairn

SCHOOL TESTER

'The Examiner', Acornsoft, Model B, tape £9.95

ACORN SOFTWARE is not the most imaginative of software houses, and this especially shows in their range of educational software: elementary maths programs, simple science experiments, and now multiple-choice tests. *The Examiner* lets a teacher design a multiple-choice examination 'paper', in which the computer displays the questions, stores each pupil's answers and produces a table of scores for the whole class.

On first running the program you enter the date and are then presented

with a menu of commands. Only the teacher should see this, for one option displays the answers along with the questions. Others let you load or save a set of questions on tape, enter new questions or run the examination.

If it's a new examination you select the 'enter questions' option and supply a title for your question paper. Up to 40 questions can be set, each with up to four possible answers, only one of which can be correct.

Assuming you have some questions in memory – a sample data file of general knowledge questions comes on the tape – the examination can be run. Just before this the teacher chooses how many questions to use, whether to have time-limits and whether to use sound effects. The only purpose the latter serve, being reminiscent of a motorboat engine, is to get the hapless candidate flustered.

The computer is now turned over to the children and from this point it does a passable imitation of Fort Knox: no amount of mischievous key-pressing will retrieve the menu and the all-important answers. Pressing BREAK or

ESC has no disastrous effect – it's just interpreted as a wrong answer, though CTRL-BREAK will inevitably lose the data.

As each pupil finishes the paper his or her score is stored in memory and when the whole class has finished the teacher can, by the use of a password, see the scores for the whole class. Up to 40 pupils can be examined this way; if the class is larger the paper can still be set, but the scores have to be written down as each pupil finishes.

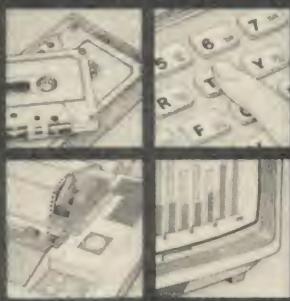
Overall, the program works well; a lot of thought has gone into making it easy to use, while at the same time making it tamper-proof. The question must be asked, however, as to whether using a computer to set multiple-choice tests is a suitable use of a scarce resource.

Geoff Nairn

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MAILBOX MODIFICATIONS COME IN

ANSWER TO A JOURNALIST'S PRAYER

IF I WAS still saying my prayers at the foot of my bed it would be only fair to put in the occasional good word for a programmer down in Sussex called Alan Wilmshurst ... after all, he came up with the answer to my prayers.

You may recall that last August I was describing how Prestel's mailbox might be the answer for those publications needing some system for receiving copy from its journalists but for whom the expense of a mainframe computer couldn't be justified. I was already filing copy on my Beeb to the medical magazine *Doctor* which puts out its own Prestel magazine. The only problem was that I was having to compose each mailbox frame on-line. Those familiar with mailbox will know that this is both time-consuming, ties up the telephone (and so is expensive), and trying to edit mistakes on-line is far from easy.

Since then I have seen a number of methods for composing mailbox frames off-line. The way many BBC



users on Micronet are familiar with is the Micronet ROM which both does away with the need to load the terminal software and enables frames to be prepared. However I am far from impressed, either by the ROM or its mailbox editing facilities. The answer for my money is a combination of programs devised by Alan Wilmshurst. Both of his programs enable up to 20 mailbox frames to be prepared off-line and held in the computer's memory or saved on tape or disc. Pages can be just normal white type on black backgrounds or coloured type with graphics.

The software, called *Auto-Message*, is adapted from Micronet's version 4.0, to enable frames to be downloaded one at a time, plus one or two other neat refinements which make me prefer loading his enhanced software to the instant ROM. But more of the terminal software shortly. First, let's look at the message composer and its features.

When first loaded the program begins by asking whether you will be working with old pages (frames stored either on disc or tape or already in the computer's memory). Pressing 'N' immediately clears the computer's

Bill Penfold revels in a unique combination of programs for serious mailbox users

'Auto-Message' Micronet enhancement by Alan Wilmshurst, Summerhill, Coopers Lane, Crowborough, E Sussex (tel: 0892 662956), tape £6.99

memory. Next, you are asked how many indents you want at the beginning of the first line of the frame. Normally I put in two and for those using the mailbox response frame on Prestel page 77 that is probably the most useful. After that you are presented with a menu of five choices. The first is to prepare a frame (I'll describe how that works in a moment).

The second choice is to load previously-saved frames. If you type 'Y' for yes at the initial screen you are given an option to search for a file name. Once you have completed the frames to send, the third option allows you to 'save' the program. It starts by asking you how many frames you will be saving, and after that the file name.

The fourth option is a useful copy facility. For example, suppose you want to send out the same message to a dozen friends with only a slight difference to each, such as their names, ... 'Dear Tony ...' 'Dear Diana ...' etc. You simply prepare your master frame, say for instance on page 20, then copy it onto pages 1, 2, 3 etc, just adding the alterations to each.

The fifth option simply allows you to leave the program, after which you would probably 'load' the enhanced Micronet software.

But let's go back to the first option. You press one and return and on the screen appears the page on which you will compose your Mailbox message. But first you have to input which frame page you want. The obvious response is to start at frame one and work your way through. However, this enables you to return to a previously completed frame to check or change it.

Next comes another useful feature of the program. The cursor first shoots to the bottom of the page to allow you to put in the mailbox number. You don't have to use this but it can be handy. For instance, if you are sending a long message to the same person, say six or seven frames, you need only type in the mailbox number on the first frame and then before typing in your message use the copy facility on option four, to insert



Micronet and Beeb make news
Bill Penfold reports on developments which could revolutionise reporting



Flashback to the August '83 issue

the number to the next half-dozen frames. Alternatively you can temporarily leave the program through option five and set the function keys with the mailbox number to insert in each response frame in the composition.

Now you are ready to start typing in your message, and this is where anyone who has tried typing a message while on-line to a mailbox response frame will find the editing facilities a joy. You can delete letters, insert spaces, delete lines above the cursor, insert blank lines and generally use a simple word processor. The delete key works as normal, but the copy key deletes the line above the cursor, and does not close up the text.

I first began using this version of Alan Wilmshurst's program about the beginning of the year and I thought he had gone about as far as he could go: but no, a mailbox message arrived with colour and graphics. The only disadvantage to this is that the response frame is limited to just 12 lines. This can be changed, but only to 13 lines, and you then lose the colour and graphics.

Once you have composed your mailbox messages you don't necessarily



have to save the frames if you are straightaway going to load the Micronet terminal software. However, I invariably do... just in case.

Now for the terminal software. To enhance the program to send the prepared messages Alan Wilmshurst provides three separate sub-programs which alter Micronet's 4.0 version. This

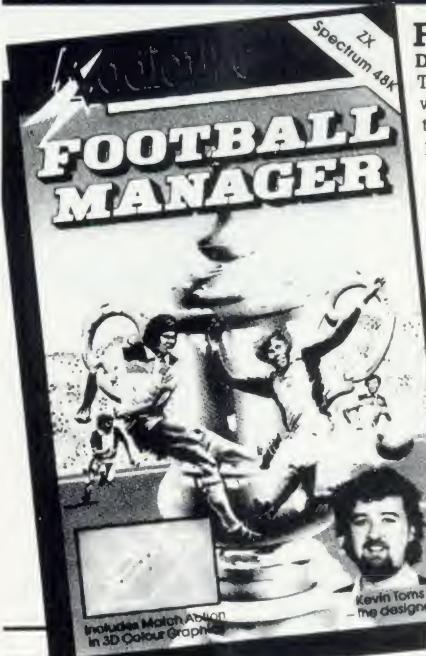
page 153 ►

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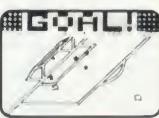
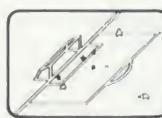
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PICTURES ON A PAGE

Dee Vince reviews three packages claiming to turn micros into electronic canvas and digital oils

Sketch Pad, Goldstar, Electron and BBC, £9.95. Paintbox, Beebugsoft, BBC (joystick only), £10 (disc £12, 3in disc £15). Picture Maker, Acornsoft, BBC, £9.95 (disc £11.50)

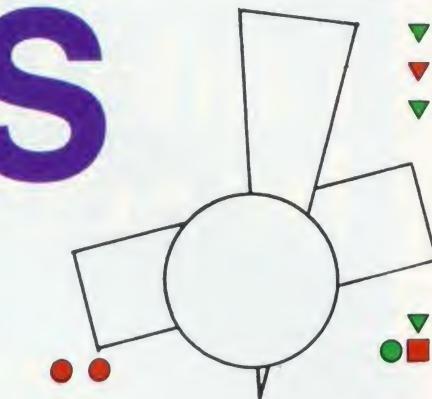
IT IS especially interesting to carry out a comparative review when the packages concerned all claim to do exactly the same job, in this case drawing pictures. Judging such software is difficult as there are many different criteria, so I shall try to cover all the various aspects of these programs. Let's start with the loading procedures. *Sketch Pad* has to win here for its novel title page. Part of the screen is drawn with a 'laser' light similar to the opening titles of ITV's World of Sport. It's a simple idea, but effective. Now, onto the programs.

All these packages present a blank drawing screen with a horizontal option menu. In the case of *Paintbox* and *Picture Maker* this is at the top, with *Sketch Pad* at the bottom. *Sketch Pad*'s menu displays eight colours and an assortment of drawing options, all on the one menu. *Paintbox* also has a palette of eight colours, but with a secondary menu to cover its range of drawing options. *Picture Maker* gives the ability of using 15 colours, though when drawing only the colours of modes 4 and 5 are available. That might sound contradictory, but I'll explain it later. Let's look at *Picture Maker* first as it is the most difficult of the packages, though the most comprehensive.

Picture Maker works on two levels: a 'catalogue level' and 'picture level'. When first entering the drawing program the user is taken into catalogue level. This is a blank screen showing the number of bytes left in memory and the names of any units (picture files)

which are currently in memory. From this level operating system commands can be used (as well as all disc system commands), and the commands which manage the program's system for naming units, saving and loading, changing screen modes and displaying the current picture.

The picture level is where the drawing takes place, starting off with a blank screen and a menu at the top which says which drawing option is being used: line, text, triangle, etc. In common with the other packages the colours are displayed in a strip, but here *Picture Maker* does differ. As mentioned earlier, 15 colours are available, but not when drawing. What happens is that the extra seven are repeated in the colours of the present screen mode along the strip of palette colours. Confusing? Well, it is! However, it does actually work as the drawing recorded on file contains the colours the user specifies, not those available when drawing; so when the picture is redrawn



the full range of colours is shown.

This is somewhat unfriendly and perhaps another method, such as naming or specifying the number of a colour, would have led to less confusion. But to be fair, *Picture Maker* is a superb package and is easily the best of the three reviewed. It is also the most difficult, but worth the extra effort. *Picture Maker* allows the user to merge different pictures together, each picture being a unit, thus the reason for the catalogue level displaying the different units in memory. Another extensive feature is the text mode. Besides normal size text, a number of special effects are possible. The text size can be changed by a 'transform' option that allows the text to be expanded and rotated. The shape of the text can be changed by altering the scale of the letters in two directions and text can be spaced in any direction. All these transformations allow a variety of effects to be created including special effects such as mirror images and italic typefaces.

The transformations mentioned can also be used while drawing and allow powerful manipulation of a picture unit.

Example from
Picture Maker



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Another feature allows a shape from a previously drawn unit to be taken out and merged into the current picture.

Producing standard shapes is straightforward and requires only choosing the appropriate drawing mode. All three packages have circles, triangles and lines and involve a few easy steps. There is much to cover in *Picture Maker* and I have only pointed out a few of its features. The normal drawing commands are all present and I'll return to the rest of the package shortly. But now to *Paintbox*.

Paintbox can only be used with joysticks, unlike the other two packages. Options are chosen from one of two menus by just touching the appropriate menu option with a cursor and pressing the fire button. It is certainly easy and fixing standard shapes is no problem. Eight colours are used, though by using the 'in-fill' option a ninth colour, which is a mixture of two others in a striped effect, can be created. *Paintbox* also has a feature I like that is lacking from the other packages, namely co-ordin-



Picture Maker

nates of the cursor on the screen. It does, however, only work in one of the 'brush' sizes. That point neatly raises the use of different brush sizes, eight in total, with the option of a ninth variable size chosen by the user. This is done by setting the brush size equal to the length of a drawn line.

The erase option is merely a clear screen facility and changes the background screen to the currently-defined brush colour. This makes erasing part of the picture difficult and means trying to erase your mistake by redrawing in the background colour (though this is not covered in the manual). *Paintbox*, in common with *Picture Maker*, makes use of the GCOL command. This gives a number of effects to choose from and controls the way in which a colour is placed on the screen. This means the plotting of colours can be as specified, OR-ed, AND-ed, EOR-ed or have the colour already there inverted.

The secondary menu allows the choosing of the eight brush sizes and the size of text relates directly to the

size of the brush. *Paintbox* doesn't have the range of commands of *Picture Maker* but is easier than the other packages initially, although it does require a joystick.

Finally, *Sketch Pad* from Goldstar. It was the cheapest of the packages – and the most attractive on first sight. Boxed in a video case, it is well-presented and is provided with a separate list of commands card and a colourful 21 page manual. Options are chosen by pressing the keys usually in conjunction with the control button. Out of the three

scope for the added effects of the other two packages. Text can only be entered in one size and as with *Paintbox* there are eight colours with an extra colour available, which is a mix of two colours in one of three effects – chequerboard, striped, or horizontal stripes.

Sketch Pad provides a potentially good command not implemented in either of the other two packages, a magnification function. This allows the



Paint box



Paint box



Sketch pad

menus I liked this one the most. The pen up/down indicator for instance is a picture of a pen nib either in the air or on the paper. The range of commands is limited to the standard commands (line, triangle, circle, etc) with little

user to enlarge an area four times its normal size for easier correction. Although the area is limited, this is a worthwhile addition.

Having briefly covered the main aspects I'm now going to turn to the
page 153 ▶

Package	Prices	Entry method	Machines	Summary
Picture Maker by Acornsoft	£9.95 cassette £11.50 disc	Keyboard Joystick	BBC B	Easily the most sophisticated, but can also be complicated
Sketch Pad by Goldstar	£9.95 cassette	Keyboard	BBC B Electron	Excellent packaging and presentation; very attractive to children
Paintbox by Beebugsoft	£10 cassette £12 disc £15.3in disc	Joystick	BBC B	Easiest to use, but if you haven't got joysticks...

BBC DUAL DISC PAYROLL PROGRAM

For 150 employees with 100K disc using random access operation.

Calculates most tax codes and national insurance rates. Calculates up to 24 fixed deductions per employee including employer's and employee's pension contribution and S.S.P.

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Has a complete end of year routine for tax returns.

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Comprehensive facility for selecting and printing using any user definable criteria.

BBC B DISC MAILING LIST PROGRAM

Stores up to 350 names and addresses per 40 track disc or 700 per 80 track disc.

Incorporates comprehensive search facilities for selective printing of labels, envelopes and letter headings.



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BBC B	£395 + DFS	£469
Electron		£199
Spectrum		£125

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Colour/Green Novex 1414	£228
Green Sanyo DM2112	£80

PRINTERS

RX-80	£290
RX-80 F/T	£325
Gemini 10X	£255

DISC DRIVE

Single 40 track 100K	£170
Single 40/80 track 100K	£299
Dual 40 track	£350
Dual 40/80 track DS	£575

SOFTWARE

Payroll :- 40 or 80 track £49.95; Torch Z80 £74.95
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Discs from £19.95, cassettes from £0.55 and joysticks from £17.50, leads from £2.50.

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port for string, numeric, integer and date fields. ★ 5 date formats and strings of up to 150 characters long allowed. ★ Automatic allocation of disk space for files and extension of this as and when necessary. ★ Rapid switching between use of separate files. ★ Batch updating and deleting of records. ★ Optional program monitor enabling, among other things automatic checking to warn you beforehand of duplicated record entry. ★ Fields can be inserted, deleted, moved or renamed, indexed or de-indexed. ★ Field types and entry lengths are also alterable. ★ Up to 10 files each with any or all of the fields redefined in any of the above variety of ways can be processed in a single batch operation.

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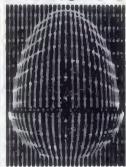
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GSL Winchester Hard Disk System for the BBC Micro NOW INCLUDING REMOVABLE CARTRIDGE DRIVES



GSL staff are working overtime to meet the still increasing demand for their Winchester Systems.

As leading suppliers of Winchester hard disk systems for the BBC micro, GSL has consistently improved both the scope and quality of its products. Since the introduction of the first 20 MByte, 8" Winchester unit at the start of 1983, the range has expanded to include 5.25" drives from 5 to 116 MByte, tape streamers, a comprehensive Winchester Filing System (WFS) and a flexible networking system.

A new addition to this product list is a removable cartridge drive. This is half-height mini-floppy size. The cartridges themselves are less than 4.5" square, and contain 5 MBytes of information. The units are front loading, cartridge replacement being performed in a matter of seconds. Cartridge drives may be used in their own right for stand alone systems, or can be integrated into a system with a large, fixed hard disk for back-up purposes, providing an economical alternative to a tape streamer.

All Winchester systems are fully cased, and self contained, the only connection required, apart from mains, is to the 1MHz bus connector of the BBC micro. The WFS or network (E-Net) firmware is supplied on



The New Streamlined Winchester System.



Winchester Disc Drives are put through a 24 hour intensive test programme prior to despatch to customers around the world.

Eeprom. Fully rack mounted systems may also be provided, and other facilities available include a real time clock, and a link board for connecting two micros to one Winchester system.

New Winchester Backup Facilities

Backup of the E-Net filesaver Winchester has up to now been limited to selective transfer of user areas to floppy disk. In order to augment this, the following facilities are now (or shortly will be) available:

- (a) Backup of user attributes to floppy disk. (Available on application)
- (b) Full backup of the filesaver drive to a second (similar) Winchester unit. (This should be available within few weeks)
- (c) Full backup to removable cartridge drives. At present only 5 MBic units have been evaluated, necessitating the use of two cartridges for backup of a 10 MByte Winchester. (Expected availability is 1 to 2 months)
- (d) Full backup to tape streamer (20 or 45 MBytes). (Expected availability is 2 months).

Existing single Winchester systems can be upgraded to contain backup units for any of options (b), (c) and (d), additional hardware being accommodated within the current casing. At present the most cost effective solution for pure backup purposes is likely to be option (b), with (d) the most costly, though in the latter case some improvement is hoped for before the end of the year. Prices are available on application.

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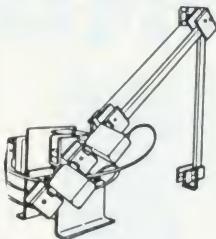
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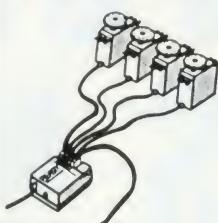
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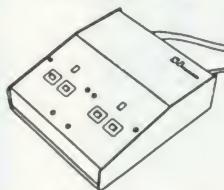
VISION



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The Control ROM provides an extension to the BBC Machine for control applications. It's an essential tool for anyone teaching computer control techniques, or who wants to use the computer in practical control applications. The process of sending signals to control devices is very crudely handled by most micros and the Control ROM changes this.

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'SKY-BABY' 's many features include:

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'SKY-BABY' package, consisting of C10 Cassette containing three files (program itself, stellar library, auxiliary program), and 35-page User Guide £12.50 inclusive

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STOCK CARS

ON THE GRID

'Stock Car', Micro Power, BBC B, £7.95

THE object of this game is to drive a stock car round a circuit chosen from six different circuits.

The computer controls three other cars to get in your way or, on an optional two player game, it controls two cars, making a total of four cars on the screen at any one time.

On starting, the computer plays a short tune, the engines start, and you're off! You must change into first gear from neutral going gradually through the gears, dodging the computer's cars, and carefully negotiating the corners.

The graphics are quite good. The game draws six circuits, oil slicks, and the cars, in which your car is detailed,

but the computer's cars are plain. I feel the cars are a little small. I also found that if you get stopped on an oil patch it is hard to see your car, and in which direction it is pointing. On the whole though, the graphics are good-smooth, and without flicker.

The sound also is high standard. The computer plays a short tune before and after the game, you can hear the engines starting, cars bumping and the noise of cars crashing into walls. There are even two separate noises for changing up and down the gears.

This game's flexibility is excellent: You are offered one or two players, up to 40 laps to complete, optional oil slicks, variable skidding, sound on or off, six different circuits, optional joysticks, and joystick sensitivity select.

On the control side, *Stock Car* is a little hard to get the hang of at first, but it seems simple after playing for a while. Driving resembles driving a real car. The keys are very sensitive,



Stock Car: Good graphics and sound
though a little cramped (to allow two people to play at once), and it is sometimes hard to get going once crashed.

Overall, *Stock Car* is an exciting, original, addictive game, with good sound, good, smooth graphics, and comes with clear instructions.

Ian Brettell

◀ page 145

includes an altered 'PTERM' which enables you to add a number of useful features. For a start you can insert your private Prestel ID number which is sent by pressing the TAB key. It is also possible to store three other numbers which are sent by pressing CTRL and function keys 6, 7 and 8. It is possible to use these to automatically call up particular Prestel pages, or frequently used mailbox numbers. A third option, although this would be frowned on by Prestel, would be to enter your four-character ID response as well.

As soon as you log on to Prestel you will notice something different on your screen - a stop-watch ticking away the minutes you are on line, and the hours if you are on long enough. If you want to see the seconds as well, just press



CTRL f2. After being on line for seven minutes a short buzzer sounds to warn you there is just a minute to go before being charged for the next eight minutes. The buzzer sounds again after every eight minutes. For the clock alone I reckon this enhanced software beats the pants off the Micronet ROM.

The method of downloading is also fairly straightforward. You go to your mailbox response frame, say Prestel page 77 if it's just an ordinary message or page 88 if you want to send colour

and graphics. The cursor waits for you to input the mailbox number. If you've already put the number into your pre-prepared page you simply press f6 and it appears. Then press f7 and the first frame begins forming, line by line on the screen. For a full 13-line message it takes about 80 seconds.

If it is all right, you send the message in the normal way, then, instead of the return key to clear the page for the next message frame, you press SHIFT f2. Now you can either send the same frame again, possibly with a different mailbox number, or you can move on to the next pre-prepared page by pressing SHIFT f7.

One day of course this form of electronic mail will seem crude and cumbersome. But it is cheap, relatively easy and available.

◀ page 149

remaining parts of the packages. Redrawing a picture is often given less consideration than it should but not in the case of *Picture Maker*. Unlike the other two packages which allow the saved picture to be redrawn (*Paintbox* also giving details of the *LOAD address), *Picture Maker* includes a variety of ways to reshape a picture and provides much needed information to the more experienced computer user.

Picture Maker does not come with one program but five. There is the main drawing program Drawpic, and Showpic for displaying the pictures in any of five screen modes. Picdata converts pictures into Basic data statements for inclusion in a user's own program in a *EXEC file format, and Datapic converts

PICTURES ON A PAGE



this data back into a picture. There is a section on the picture memory data structure in the manual though this is not recommended for beginners! Finally, there is a screen dump facility. This, as it is covered only by an insert in the package, appears to have been an afterthought, but an excellent one it is. From either Drawpic or Showpic a picture can be dumped to disc or tape and then recreated on screen immediately. Reloading a screen dump can either be implemented by the *LOAD command

or by using the Restpic program provided.

The manuals with the packages are good overall. The *Paintbox* manual covers everything, while the *Sketch Pad* version is bright, colourful and extremely friendly. Contrasting with this is the *Picture Maker* manual which runs to 43 pages and is very comprehensive. The overall impression I gained from these packages was that the quality was of a high standard.

However, *Picture Maker* is without a doubt the most advanced out of the three. Its capabilities far outstretch the others, but it is also the most complicated and this must be taken into consideration. For completeness, though, my vote goes to *Picture Maker*.

Dee Vince

Micro Resources Limited

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BBC Model B	£399.00
BBC Model B Disc Interface	£469.00
BBC Model B Econet	£446.00
BBC Model B Econet & Disc	£516.00
Acorn Electron	£199.00

Acorn 6502 2nd Processor £199.00

This allows the BBC Model B to run faster with greatly increased memory especially in high resolution graphics modes, the package includes Tube software, the latest version of the DFS & NFS called DNFS, a Rom containing Hi-Basic and a comprehensive User Guide.

Acorn Z80 2nd Processor £299.00

If you have wondered how to make the best use of your BBC for Business, then the Z80 2nd Processor and CP/M must be the answer. This package comes with a suite of business programs, including Memoplan, Fileplan, Graphplan, Accountant, BBC Basic (Z80 Version), Cobal, Neculeus (Programming Aid), Professional Basic. This software alone is worth hundreds of pounds and with CP/M you can buy any of the programs written for this operating system.

Acorn Prestel Adaptor £99.00

Makes the BBC Micro into a Prestel Terminal revealing all the pages of information and allows you to use British Telecom Gold for electronic Mail etc.

Acorn Teletext Adaptor	£225.00
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Allows the downloading, storing and running of programs via Ceefax, transmitted free of charge, pages can also be saved and printed from all 4 channels.

Acorn Bitsik	£375.00
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Provides computer control of compatible scientific and technical equipment. Useful in experimental work in industry and education.

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This Rom based word processor has many advanced features including macros, still one of the best available on the market.

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A new spreadsheet from Acornsoft comes in a 16K Rom with a comprehensive manual, it is compatible with View and the 6502 2nd processor.

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A superb machine code assembler in Rom, includes comprehensive manual where the user is introduced to Mass and given step-by-step guide to writing source code and assembling it using Mass. Also includes a utility disc with many useful routines.

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CAMBRIDGE UNIVERSITY PRESS

AIRLINE: OUT-LAKER**THE OPPOSITION**

'Airline', Cases Computer Simulations, Model A or B, tape £6.95

FROM the cover picture of a Concorde nose-diving out of the sky, you might be forgiven for thinking that *Airline* is the latest marketing twist – a disaster movie computer program! Not so. *Airline* is a business game in which, as the blurb says, the object is to be more successful than Sir Freddie Laker.

You are chairman of L-AIR, a small struggling airline with initial capital of £3 million. Within seven years – not real time! – you have to try and increase your net assets to £30 million.

At the beginning of each financial year you are presented with a graph of the forecast passenger payloads, from



which you choose the best number of aircraft to operate. For the first year of trading you don't have enough money to buy an airplane outright – they cost £10m each – and so you have to charter the required number, referring to a graph of charter rates. In more profitable years you have to decide whether it is cheaper to hire or buy aircraft, and in this case a graph of loan interest rates can be studied.

In a similar fashion the manning, maintenance and insurance levels have to be chosen: too low means some flights might need to be cancelled, too high and the cost might be crippling.

At the end of the year the accounts are closed and a balance sheet gives L-AIR's overall performance before you start a new financial year. If you lose £10m in one year, as I did, however, the receivers are called in and the company is liquidated!

A nice touch in the program is a 'ticker tape' which occasionally crosses the screen with telex messages – OPEC increase oil prices, for example. Two versions of the program are on the tape: the basic version for

model A, and one for the B with graphs of interest charges and 'chairman's statements' at the end of each year.

Airline features excellent use of graphics, simple instructions and a fair degree of financial realism. It is quite compulsive!

Geoff Nairn

FROG ON THE RUN

'Hopper', Acornsoft, BBC B and Electron, £9.95 (disc £11.50, ROM cartridge £20)

HOPPER is one of my all time favourites having been around in both BBC and Electron versions since the dawn of both machines. Perhaps its popularity has been partly due to the fact that it was also one of the original arcade games that everyone used to play in pubs, clubs and amusement arcades in those pre-home computer days.

The object of the game is to hop your frog, coloured green of course, across a busy motorway onto the riverbank avoiding the crushing wheels of four lanes of congested and fast-moving traffic. Fast-moving logs and turtles' backs provide the only refuge as you leap from one to the other in an effort to jump carefully into one of the five froggy lairs. Fail at any point and you're a gonner! Of course you do have the three obligatory lives and once you have successfully transferred five frogs into their lairs they disappear at two hundred points a go.

The game restarts at this point but is of course much more difficult! This time you must avoid the snake that crawls along the riverbank, beware of submerging turtles as you leap onto their backs and look out for a hungry crocodile that moves invisibly from lair to lair!

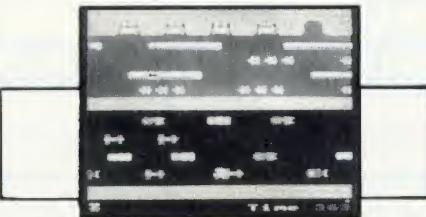
Too simple? I forgot to tell you there is a time limit to all this, a clock which counts rapidly down from 400 in about 15 seconds, if you're not safely home by then, well bye bye froggy!

Another nice aspect of *Hopper* is the musical accompaniment which sounds good even on the Elk.

A joystick is best but otherwise four keys are enough to move froggy left, right, forwards and backwards, so there are no problems with knotted fingers.

As a simple relaxing family game I reckon you can't go far wrong with this one.

Bruce Smith

**FRENZY IN****THE LABORATORY**

'Frenzy', Micropower, BBC B, £7.95

IN THIS game, deadly sub-atomic particles are loose in a scientific research centre. These particles are called Leptons. You must manoeuvre a robot-controlled craft around the laboratory, and trap the Leptons. The craft leaves an ion trail behind it and the area enclosed by the trail is filled in. If a Lepton is enclosed in this area, it is destroyed. You may also capture a Lepton by filling in 95 per cent of the screen. You are pursued by Chasers who follow your trail, and will kill you if you meet them.

The graphics are poor. Your craft is a square, a Lepton is a bouncing line, and a Chaser is a block. However, the movement is smooth, and without flicker.

The game's flexibility is also poor. The only option you're given is a sound on or off option. It would have been nice



to have had a joystick option, and possibly even a difficulty level.

The sound, though, is the best aspect of *Frenzy*. There are effects for starting, moving around, filling in areas, bonuses, and being killed.

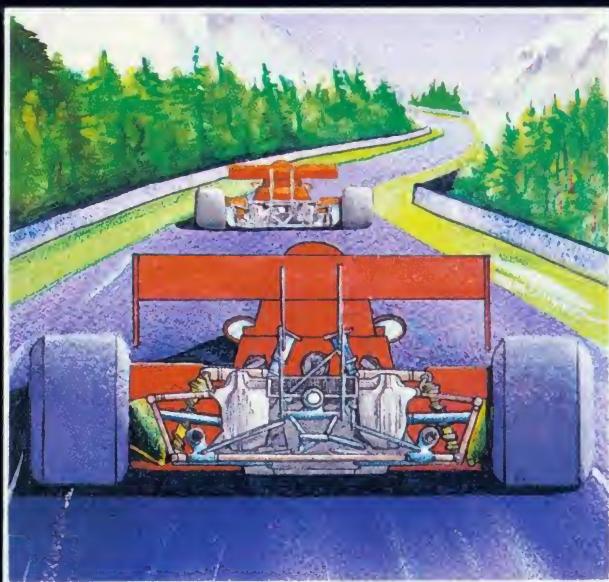
The control of the program is very easy. There are five keys to operate, four for movement, and one to leave a trail. The keys are well spaced, and very responsive.

Overall, the graphics aren't up to the standard I would expect from a BBC game, with the BBC's graphics potential. Neither is the flexibility of *Frenzy*, though the sound is quite impressive, the controls are easy, and it is supplied with clear instructions. *Frenzy* isn't really original, in that it reminds me of *Demon Decorator* by the same company. Even though I am not thrilled with *Frenzy*, it has something, though I don't know what, which makes it quite an addictive game. In my opinion, *Frenzy* rates 65 per cent. Ian Bretell

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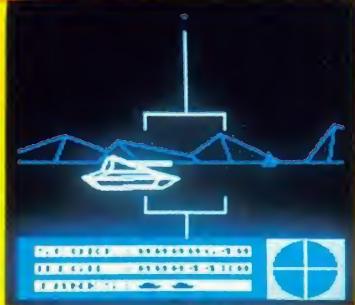
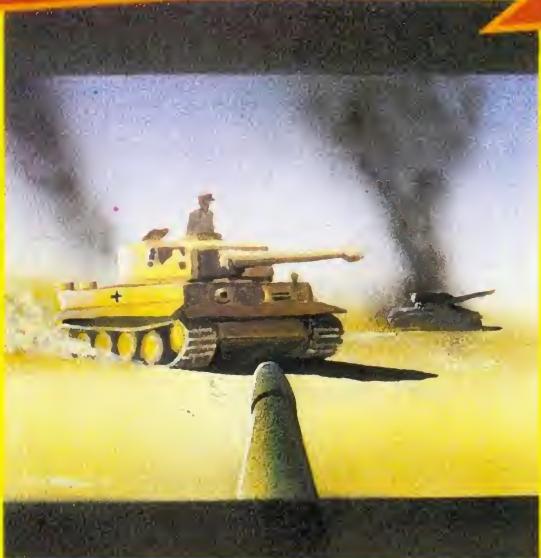
OVERDRIVE (32K)

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A highly-addictive multi-stage 3D race game. You steer your car left and right, accelerate and decelerate as the opposing cars weave about the road. There are five different stages including night, snow, desert, and riverside scenes. To qualify for the next stage, you must finish in the top twelve. Incredible graphics give the impression that you really are taking part in the race. Highly recommended, and destined to become another top-seller for Superior Software.

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Interbeeb versatile interface, MCP Microdevelopments, BBC B, £69.95 (basic unit)

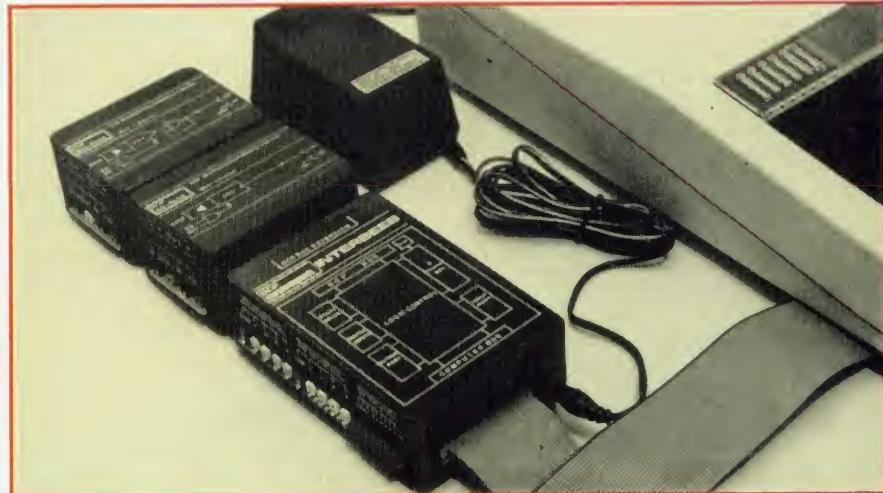
DCP Microdevelopments has produced an interface pack for the BBC micro which has such a range of applications that it is difficult to know where to start. Perhaps the best place is with the little black box containing all the hardware.

The black box, which measures 120mm x 80mm x 40mm, contains four switch inputs, four relay outputs, an eight-bit input port, an eight-bit output port and a medium speed, eight-channel analogue to digital converter (ADC). It also has an expansion bus which allows the use of add-on units such as digital to analogue converters and very fast ADCs.

The Interbeeb is connected to the BBC micro's 1MHz bus and is supplied with cable and a separate nine-volt power supply. The addresses used for the interface are those recommended by Acorn, the eight-bit input and output port having the same address (&FCC2)! No confusion occurs though, because if you write to the address, it outputs the data to the output port, and if you read it, you are reading the data on the input port. The voltage levels for the data are 0V and 5V, ie TTL levels. The output port will supply (source) a maximum current of 2.6mA when the output is at logic 1, but will sink 24mA when the output is low, ie logic 0.

The switch inputs are all held at a low voltage level, logic 0, by internal resistors so the user has to connect these through switches to the +5V line. The internal 5V line is terminated close to the switch inputs for easy access.

The four relay outputs are all onboard with their contacts brought out to the edge of the board on 2mm sockets. One line is common to all the relays which are each capable of switching



Interbeeb with power pack, AD and DAC packs

voltages up to 12 volts (ac or dc) and currents up to 1A. The address for the switch inputs and for the relay outputs is &FCC1 with an arrangement similar to the input and output ports, ie writing to the address sets the required relay(s) and reading from the address reads the switch settings. Differentiating between individual relays or switches is achieved by the 'value' assigned to each. For example, the relays have the values 1, 2, 4 and 8 respectively, so to turn them all on, you use ?&FCC1 = 15; similarly to read the switch inputs use switch% = ?&FCC1 to store the value in the variable switch% or PRINT ?&FCC1 to display the value on the screen. If, for example, switch% = 6 then switch inputs 2 and 3 are high (+5V).

The eight-channel ADC has an eight-bit resolution and uses address &FCC0. Conversion is started by writing to this address with a ?&FCC0 = n instruction, where n is the channel number required. The data is then read by an expression such as ADC% = ?&FCC0

(or PRINT ?&FCC0), ADC% returning with the conversion value. The manual quotes the conversion time as being less than 100µs, and on the unit we had for review it was faster – 64µs.

Expansion is via the 'DCP bus' and extra units are simply plugged in. Units available include a very fast analogue to digital converter (AD-Pack) with a conversion time of 10µs which makes real-time processing of audio signals a possibility, and a digital to analogue converter (conversion time 1µs!). Also available are a connector pack for ease of connection to the DCP bus, input and output ports, and an LED indicator pack.

DCP Microdevelopments also makes an Interspec interface unit which is similar to the Interbeeb but for the Spectrum. The facilities on the Interspec are identical, and all the expansion units are cross compatible. Thus it would be possible to develop a project on the BBC machine using Interbeeb and, with the necessary modifications to the Basic program, run it on a Spectrum fitted with an Interspec pack, so you are not tying up an expensive computer for a dedicated task.

The interface is extremely versatile and sufficiently robust to stand up to the sort of wear and tear it might receive in a school laboratory. All in all, a good investment, and although it may seem a little expensive, remember that all peripherals have been affected by the recent rapid rises in the prices of integrated circuits.

Paul Beverley

Prices including VAT (post and packing £1.95)

Interbeeb with 9V mains power supply	£69.95
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For information contact: DCP Microdevelopments Ltd, 2 Station Close, Lingwood, Norwich NR13 4AX. Technical enquiries should be made on Cambridge (0223) 833902 or Hemel Hempstead (0442) 64225. Educational enquiries to Griffin & George, who also supply the Interbeeb, Interspec and the expansion units.

A World Of Information

Available to you with Nightingale, the new multi-function modem from Pace.

Nightingale is by far the most versatile modem available, at the price, for either home or business use. It offers Prestel/Viewdata baud rates (1200/75 & 75/1200) alongside 300/300 baud full duplex for communication between the BBC and other computers, including bulletin boards.

Nightingale will operate at both European and Bell frequencies for compatibility with CCITT and American systems.

The state-of-the-art modem chip technology employed in Nightingale requires minimal support circuitry resulting in low power consumption, low cost, high quality and extreme reliability.

Nightingale being 'hard wired' is not subject to the noise interference errors common to outdated acoustically coupled devices. In addition Nightingale features a simple self test facility for easy installation.

Nightingale utilises a fully buffered RS 423/232 serial interface and is supplied complete with a lead suitable for connection to the BBC micro, other leads are available on request.

However, in order to use such a versatile modem to its fullest potential, you will require equally sophisticated software. This is where Pace can offer you a total solution — Commstar, unquestionably the most comprehensive communications software available for the BBC.

Supplied on Eprom, Commstar is instantly accessible, simple to use and extremely flexible. Just look at the possibilities: access Prestel, Micronet, Viewfax, Homelink and Telecom Gold, rummage through bulletin boards and chat to literally thousands of other computer users, but there's more. Commstar can be used to emulate specific terminal types such as VT 100 by means of a configuration disc, thus providing the opportunity to use the BBC as an inexpensive work station for a main frame or mini-computer.

The complete Nightingale/Commstar package for the BBC micro including the modem, cabling and the Commstar Eprom and manual is just £139 plus V.A.T. Nightingale is available separately for the BBC and other computers at £119 plus V.A.T. and Commstar is £29.57 plus V.A.T. Further details are available, please telephone or write for comprehensive fact sheets.



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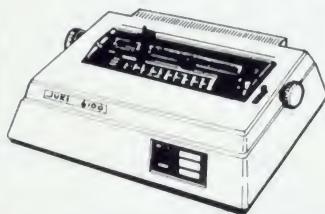
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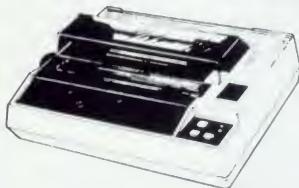
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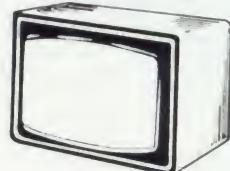
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TALK WITH TORCH

FOR several years now Torch Computers has been shipping products based on the BBC micro. The company's original machine, known as the 'C' series, is a ruggedised BBC computer with expanded keyboard, Torch Z80 second processor and a sophisticated modem. Fairly soon after the C series, Torch released the Z80 second processor card in its own right, and has since shipped more than 10,000 of them to BBC micro owners.

Both the modem and the Z80 card were major selling points of the C machine, though its price of over £2,000 prevented it from selling in huge quantities. Only in the last few months has Acorn managed to get its Z80 card out, and during this time Torch has been the only consistent source of CP/M add-ons for the BBC micro. More importantly in this context, the modem was a tremendous boon to the machine. It is a Prestel-standard 1200/75 baud device with the all-important auto-dial and auto-answer capabilities.

When the C Series was launched Torch made great noises about the communications capabilities of the machine, and produced a piece of software called Torch Mail to prove it. Torch was in fact absolutely right: the machine is well suited to communications, and the Torch Mail package has been reasonably successful despite a lack of publicity. It is primarily the cost of the machine which I believe has prevented it from getting a lot of public attention, but that situation is soon to change. Torch owners can now use a major upgrade to the Torch Mail software known as, wait for it, Torch Mail Plus! And exciting stuff it is too.

'Hmmm . . .' I hear readers saying: 'This is *Acorn User*, not *Torch User*'. True enough, and the important thing is that Torch has had the brains to offer a complete package to allow Torch Mail Plus to run on the BBC micro. What is more, it gets a new name, and properly re-written documentation. The Unicoms package, for that is it, will

The Unicomm package

Communications software (with OEL Telemod 2 modem) for a BBC micro fitted with the Torch Z80 pack:

Uniview: viewdata terminal program

Uniterm: electronic mail terminal program

Unimail: computer to computer program

EXCLUSIVE: Alex van Someren reports on a communications pack for the BBC micro developed by Torch

161



Torch C series computer: first with built-in modem

run on a BBC micro with dual drives and a Torch Z80 second processor (no Acorn ones I'm afraid). So the Editor sent me up to darkest Shelford to have a look at it.

Unicomm

The Unicoms package consists of an OEL Telemod 2 modem (no auto-dial or auto-answer, but more on that later), a lead to connect it to your BBC machine and three pieces of software with associated manuals. As I said above the manuals are genuine re-writes, rather than daisy-wheeled versions with every occurrence of 'Torch' replaced with 'BBC micro', which makes a pleasant change. The software is nothing short of gorgeous: just what the doctor ordered with menu-driven controls, pop-up 'Help' windows and screens that change colour to tell you what's going on.

Uniview

Uniview is a viewdata terminal program (ie Prestel, Micronet, etc) which does everything possible for you. It opens up with an 8-column menu of host computers (by name) and switches to mode 7 when you go on-

line. While it can remember telephone numbers for you, it cannot dial them, so after prompting you with the number of the selected host it waits for a carrier tone on the line. After that Uniview will log you on automatically from a stored sequence that was entered previously and which it has saved to disc.

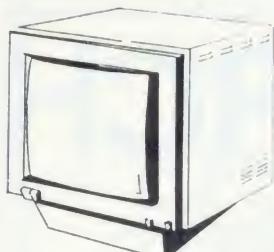
There isn't much you can say about a Prestel terminal in terms of how it looks: pretty standard stuff. Interestingly though, Torch has solved the flicker problem in mode 7 (Acorn doesn't seem to know how) and provide a control-key toggle to turn it on or off.

There are facilities for page saving to disc, happily more than one page per file, and subsequent reviewing is also implemented. Files which have been prepared off-line can be sent up to the host (useful for rude messages to Micronet) and standard format telesoftware can be downloaded to disc for future use. The text part of the screen can be dumped to a printer, but because of the variety of printers in use there is no graphics dump.

Both a Quit facility (which just 'hangs up' the call) and a Logoff command (which can be programmed to send a sequence of characters such as *90£ or whatever) are there. The Reveal function is also provided in software.

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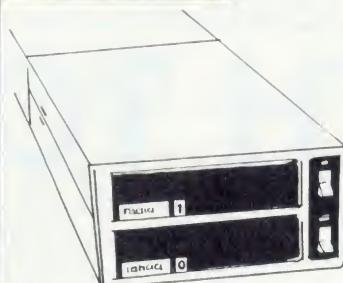


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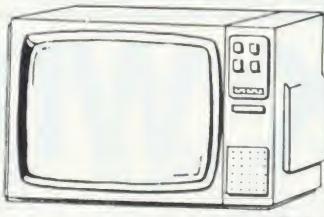
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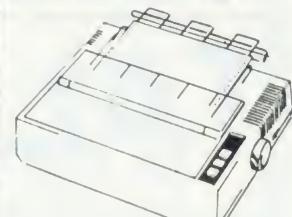
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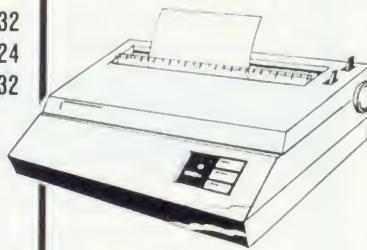
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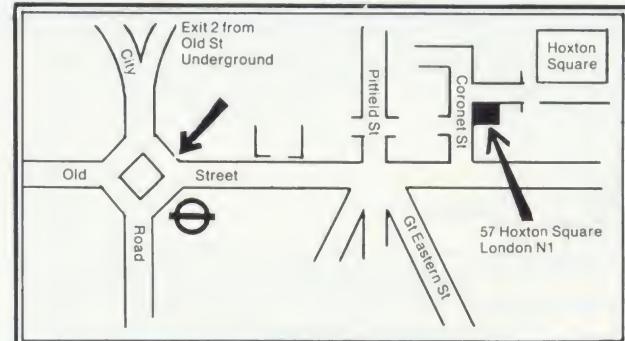
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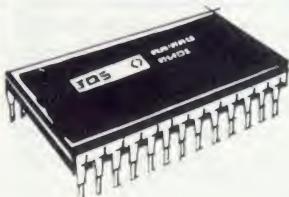


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Uniterm

Uniterm is a terminal emulator for purely text-oriented systems and works within the same basic framework of menus and windows as Uniview. Several extra features such as baud rate settings are provided (not to be tried with the OEL modem though), and a Conceal key to prevent friends/family reading your password as you type it in.

Another key allows text from the host to be spooled to disc, and it appears highlighted on the screen for as long as this is happening. Alternatively, the session can be printed to a parallel printer (the RS232 serial port is already in use, remember). Files may be sent up to the host after off-line preparation, and Telecom Gold users will probably understand what a boon this is.

Again, both Quit and Logoff functions exist, saving time and trouble if your route to the host is made through more than one system.

Unimail

Unimail is the real *pièce de résistance* of this system. It is a highly sophisticated electronic mail package and contains far more functions than we have time for here.

Torch Mail Plus, on which Unimail is based, is the result of about three years of continuous use by Torch and customers alike. As a result it is both versatile and easy to use. Messages and files can be exchanged between Unimail/Torch Mail/Torch Mail Plus systems by dialling them up and then getting the machines to converse in 1200baud blocks of data. The remote system can allow a variety of kinds of access to its files by means of a number of different passwords, everything from total prohibition of use, to the ability to copy files in both directions.

While there is a mind-boggling array of software switches and options, most of them have sensible default values. It is usually possible to hit the return key to set a parameter that you don't want to worry about and this makes life that much more pleasant.

Conclusion

While Uniview and Uniterm provide fairly standard features, they have been executed extremely well. Unimail on the other hand is both absolutely extraordinary and particularly well thought out. I was surprised that more noise has not been made about this package. It will cost about £180, and that can only be a bargain when you consider that the modem costs £85 alone. This product surely deserves to be a winner, and I have every confidence that it will be.

MODEM LOWDOWN



LEFT: The OEL modem is fairly typical of the latest products. The three lights on the left are: POWER - indicates the modem is switched on; CARRIER - lights up when a signal is being sent or received; LINE - when the switch is thrown, the modem is ready to receive or send.

The MODE switch chooses between: PRESTEL - 1200/75baud 'full duplex' standard for Micronet, etc; Tx/Rx - for personal micro to micro communications at half duplex. The only baud rate the modem allows is 1200/1200 for this; Rx - Receive only. Also allows the user to echo messages on the monitor.

BETWEEN: behind the modem. The connector from the phone plugs into the back of the modem. The lead on the right goes from the modem to the new-style BT wall socket (right). The DATA socket in the middle is the RS232 connection which goes into the BBC micro. To the left of this is the fuse and on the very left the power plug.

The RS232 connector has to be purchased separately for the BBC. OEL packages this in with terminal software for £14.95 (cassette), £18.40 (disc) or £19.95 (ROM).



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'Almost the real thing' by Malcolm Banthorpe. Because Malcolm is now a regular author – and has won a prize in Micro Gallery before, we've had to exclude his entry. However, we've printed it because it shows what's possible if you try.

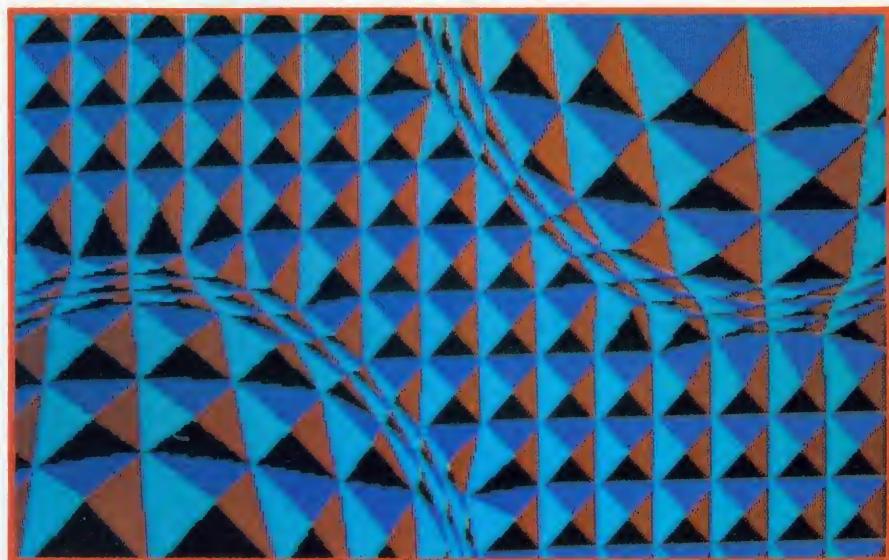
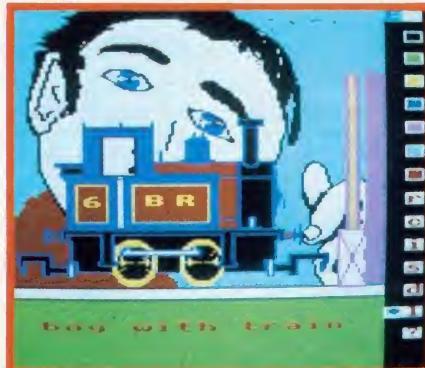
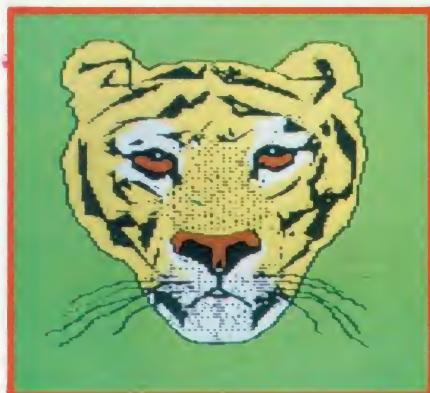
Malcolm started with a wire-frame cylinder drawn at a suitable orientation on his own software. This wire-frame structure was used as a three-dimensional grid for superimposing the lettering and other surface detail with a Graphpad graphics tablet.

An ellipse-drawing routine was used to achieve the curves of the lettering. Highlights and shading were added by the Graphpad with Gaelsett's ECFG program.

165

READERS' PICTURES

MICRO GALLERY is an occasional feature showing screenshots of graphics produced by readers. All entries printed receive software as prizes. There are few rules, but entries should be provided on cassette or disc with a short note on how the picture was developed. It also helps us if you can provide a transparency. Send your entry to: Micro Gallery, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH. Please enclose a stamped addressed envelope if you want your entry returned.

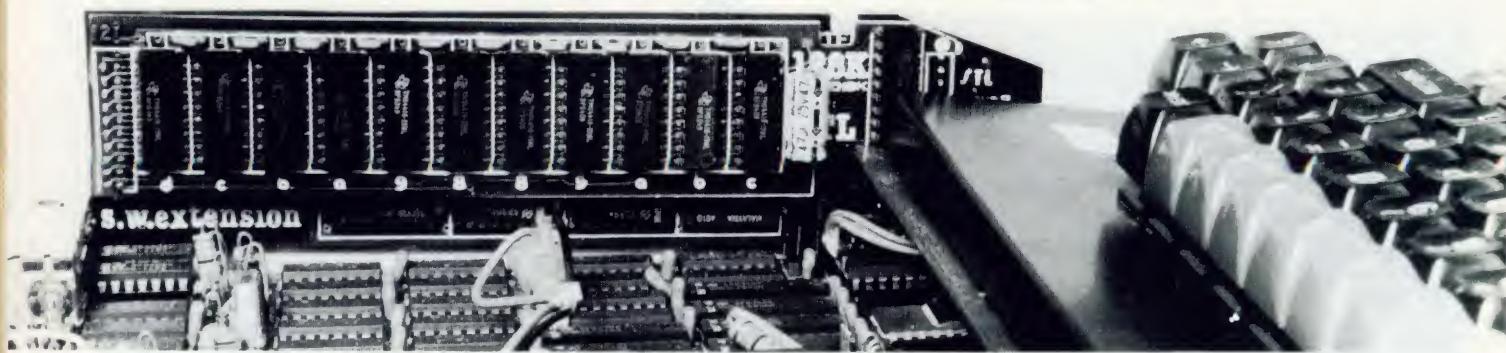


1ST. Lion, Train and Cat by Ron Owen from Middlesex. Congratulations to Ron on a series of pictures – three of which are shown here. They were all plotted in mode 2 using a combination of freehand drawing, pixel plotting, colour fills and user designed graphics. Ron wrote the software to use with Joe Telford's lightpen from AU March '83.

2ND. 3D membrane by Alain Noullez from Belgium. Pride of place goes to another sequence, this time showing the results of stretching a membrane by 3D objects. Alain wrote the software himself in Basic. The type and number of objects used and the membrane can all be altered.

3RD. Goblets by Ranjan Bhattacharya. This is a shot from an animated program which draws the goblets one by one and rotates them about their stems. Ranjan used a similar technique in his entry showing a rotating planet.

SOLIDISK SIDEWAYS RAM: 8,000 UNITS SOLD



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HOW ABOUT COMPATIBILITY?

The Sideways RAM is completely compatible with all issues of BBC computers, disks, all sideways ROMs, second processor, Torch disk pack, Teletext, Econet etc. but NOT with ROM extension boards, since it can replace them.

Its power consumption is so low that you can use it in conjunction with twin disks.

HOW DOES IT WORK?

Occupying the same place as sideways ROMs (such as BASIC, DFS, CPN etc), it is treated like other Sideways ROMs and therefore can replace them.

The Machine Operating System uses Sideways RAMs as naturally as Basic, without procedures or programming rules.

Sideways RAM can run any language, any filing system including Hi-Basic and second processor DFS.

SIDEWAYS RAM POWER IS IN THE SOFTWARE:

Different from Sideways ROMs, Sideways RAM can be written into. This property gives birth to a NEW GENERATION of software for the BBC computer: SERVICE RAMs and VIRTUAL MEMORY PROCESSOR.

Each SERVICE RAM has its own commands and code as its counterpart Sideways ROM but has its own private workspace and storage area thus leaving you with the lowest possible PAGE value (PAGE = &EOO). On the other hand, the Virtual Memory Processor can run huge MACRO BASIC programs (Megabytes are not the limit), keep them on disk and uses the basic 32k of RAM as transient program area. All software for the Sideways RAM system is free.

FREE SOFTWARE?

Solidisk Sideways RAMs is bundled with lots and lots of software, FREE and we mean FREE, now and later. It is quite simple: for every Sideways RAM sold, £1 is spent on MORE software. Sideways RAM users are invited to spot new applications and contributions are rewarded at the usual rate of £1 for every 4 bytes of machine code. The result is printed on the opposite page.

HOW ABOUT THE FUTURE?

Solidisk Sideways RAM is also widely used in schools for ECONET stations, by professional programmers for writing programs, research laboratories for RAM disk data base, at home for wordprocessing and now even games.

New areas are being developed: Telesoft and Teletext logging, Speech Processor assembler and Relational Data base to cite a few.

As the price of 16k EPROMs are as high as £20 at the present time, more Sideways ROM software publishers will be willing to sell their software on disk. Solidisk will mail FREE OF ANY COST their advertisement to ALL Sideways RAM users providing the price of the Disk version reflects savings in the cost of the ROMs. Solidisk believes that the majority of BBC users will have their Sideways RAM fitted before the end of next year.

Also unlike other makes (SIR, APTL, WE Sideways ROM/RAM extension boards and the Aries B20), Solidisk Sideways RAM is expandable from 16k right to 128k and now to 208K. As a result of VLSI technology and volume of sales, Solidisk products also have a lower shop price than any other products.

OTHER PRODUCTS FROM SOLIDISK:

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Uvipac is powered by the mains, simple to operate and can erase 3 Eproms of any type in just 15 minutes. Uvipac is ideal for home use.

DETACHABLE KEYBOARD CASE:

Remove the keyboard from the BBC computer and instal it in the new case. Replace the old 3" keyboard tail by the new 24" cable and you can work really in comfort even for very long hours. The keyboard case is more a productivity tool than just ergonomics.

CPU CASE:

Replace the top of the BBC computer case by this metal CPU case. Sit your monitor on top (it is tough enough to take even your weight!). The CPU case has 2 compartments for half height 5.25" disk drives with fixing screws, air vents and provision for a bolt-on fan. At first sight, there is no trailing wire. Looking inside, there is enough room to accomodate Teletext Adapter, Second Processor, Solidisk and a fan!

DOUBLE DENSITY DISK INTERFACE:

2 versions of this double density interface will be available: as direct replacement for the Acorn Disk Interface (Version A) and as a Second Disk Interface (Version B) adding to your existing interface. They all use the same Western Digital controller chip (WD1770). Price £39.95 inclusive

DISK DRIVES:

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All disk drives are supplied with cables, formatter disk, head cleaning kit and 2 year warranty.

"Break the Ram Barrier" (A&B)



UVIPAC EPROM ERASER



TEAC DISC DRIVES FD55 Series



WHICH SIDEWAYS RAM DO YOU NEED?

Solidisk Sideways RAM is available in 16 (SWR16), equivalent to 1 sideways ROM, 32k (SWR32), equivalent to 2 sideways ROMs, 128k (Solidisk), equivalent to 8 sideways ROMs and the 208k Solidisk equivalent to 12 sideways ROMs. You can buy a small Sideways RAM now and upgrade it later. From the SWR16 to the SWR32 is by straight exchange, from the SWR32 to the Solidisk is by adding the 96k Solidisk Extension, from 128k to 208k is by exchange of the RAM card.

FREE SOLIDISK SOFTWARE:

WORD64:

WORD 64 is a Service RAM, it uses Solidisk as storage for WORDWISE, up to 64K free characters for any text.

SILEXICON:

SILEXICON is a Spelling Checker for Solidisk. SILEX scans texts at more than a 1,000 words a minute and compares each word against the dictionary, Silexicon marks the mis-spelt words for either addition to the dictionary or eventual correction.

PRINTER BUFFER:

PRINTER BUFFER is a Service RAM, it increases 500 times the normal 32 bytes printer queue to 15K bytes, completely transparent to the user. PRINTER BUFFER is as useful for printing a long document as for a short program listing.

STLEOO:

STLEOO is a Service RAM, it is Disk Filing System that leaves PAGE at &EOO, has built-in disk formatter/verifier and automatic track stepping for 40/80 track disk drives.

STL150:

STL150 is a Service RAM to enhance Acorn's .90 DFS to offer up to 150 directory entries per side.

STL-RFS:

STL-RFS (RAM/ROM filing system) is a Service RAM and an innovation in portable applications. STL RFS saves any program in a Sideways ROM format, it can then be copied onto EPROM to give instant recall of your programs. Plug this EPROM into any sideways socket, type *RFS and it runs itself. Compatible with the ELECTRON and BBC, tape and disks, SWR16, SWR32 and Solidisk.

INDEX:

INDEX is a Service RAM, it stores all the entry points of one or several sequential data files such as mailing list, stock list, accounts etc, merges, sorts them in alphabetical order and gives instant access to any record. INDEX can handle 1,100 records of any size, any type, any number of fields.

MACRO-BASIC:

MACRO-BASIC is a program generator. You use a wordprocessor to create a command file which is then scanned by MACRO. MACRO uses other programs, subroutine libraries, text files (actually any or all files on your disks) as source to generate a bug free BASIC program which can be very large (Megabytes are not the limit).

VIRTUAL MEMORY PROCESSOR:

VIRTUAL MEMORY PROCESSOR (VMP) uses extensively overlay technique and Solidisk as back store for very large programs that cannot be run otherwise. VMP uses the 32k basic RAM as transient area: it operates on a Main Program as generated by MACRO-BASIC, taking different segments from the Solidisk Store, POOL, HOLD, FREE or CLEAR segments from the transient area. For example: VMP will accept 20 segments of 10k of Basic assembler and assembles it into 16k of machine code.

MENU:

MENU puts all computer's resources at your fingertips. MENU displays your Sideways Firmware, Disk Directories, Sideways RAM system, Solidisk System etc.

MORE FREE SIDEWAYS RAM SOFTWARE TO COME:

While others are making promises for software to be written, Solidisk Systems RAM comes with a complete, novel and powerful software package including compatibility with existing sideways software.

Each Sideways RAM is accompanied by the Sideways RAM User Manual, full 1 year warranty, 1 utility disc* and free mailing on all new publications from the Software Support Service.

*It should be understood that we cannot put as much free software on a 40 track single sided as on 80 tracks. The present software package require 160 tracks of storage and can be accommodated on ONE 2 X 80 track double sided diskette, only the most useful programs are supplied on other formats (ie 40 track single sided, 2 X 40 track double sided, 80 track single sided). Should you require the whole collection of free software, please place an order for extra disks. For the technical minded: The Source Code and Technical Manual (3 floppies and a 300 page book) price = £10, the SILEXICON EXTENSION PACKAGE (3 floppies and a 40 page manual, 30,000 word dictionary: English and French now, German and Spanish planned) price = £9.00. '4S' also publishes regular updated SWR utility discs at £3.00. Every user can do contract work for the SUPPORT SERVICE and make a lot of money for him/herself!

HOW TO ORDER?

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SWR 32K	59.95
128K SOLIDISK	150.95
208K SOLIDISK	243.00

The following are upgrade prices for existing Sideways Ram owners.

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16 - SOLIDISK (please return complete item)	109.00
32 - SOLIDISK (no return necessary)	93.00
128K - 208K SOLIDISK	93.00

DISK DRIVES:

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STL55F (2 X 80 track, double sided, as above)	232.95
STL320 (2 X 160 tracks, double sided, as above)	499.00

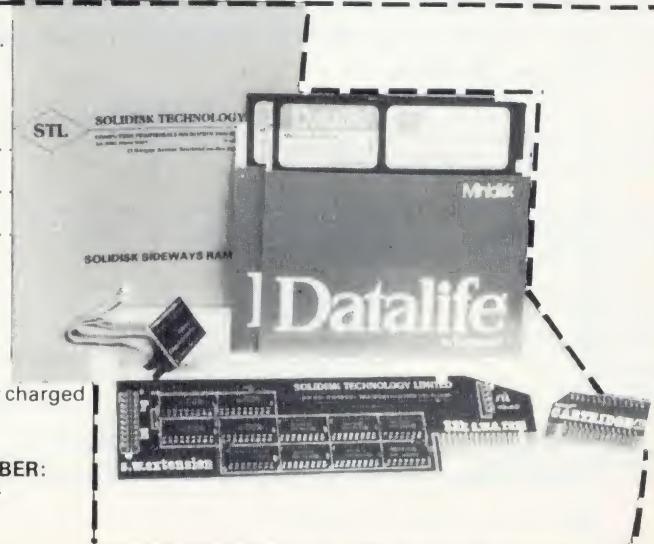
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012 ;
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014 org $1900
015 else
016 org $8000
017 endc
018 ;
019 start: ldx #0
020 0020: lda mesg,x
021 beq 2%
022 jsr osascii
023 inx
024 bne 1%
025 rts
026 ;

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DO YOU wish to sell your BBC model B for up to £250 cash, any condition considered? Ring Michael, Stithians 860580, evenings, or write to: M. Griffiths, Little Menherion, Carnmenews, Redruth, Cornwall.

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BBC B 1.2OS, Acorn DFS, Wordwise, software worth £700, 400k double sided switchable disk drive, 34 floppies, green screen monitor. Worth £1,600—the lot £1,055 ono. Tel: 047 283 378 after 7pm, Kevin Bramhill.

ACORN Atom, 12k RAM, 12k ROM. FP ROM, toolbox, PSU, all leads, £100 of software, all original. Books, manual. Offers around £100. Selling for financial reasons. Phone Geoff on Locks Heath 3889.

ATARI 400, worth £600, includes joystick, recorder and lots of games and basic language and free VCS and 2 cartridges, all going for £240. A bargain! Tel: 021-556 1566 or 021-502 5917.

CUMANA double disc, single side, little used, £325 includes postage. Churcher, 10 Park Avenue, Eastbourne, East Sussex BN22 9RN. Tel: 53822.

TELETEXT adaptor + TFS + manual £160. Hardly used. Write to 1 Japan Street, Cheetham, Manchester M8 7HF.

ACORN SOFT Meteors, £6, VU-type, £12 or swap. Ring Jason (0632) 739558.

HOBBIT Floppy tape system. Zero memory option. Fourteen tapes, £100 ono. Tel: Thame 084-421 3956.

EARLY copies of computer magazines for sale in perfect condition. Some bound. See for list. Burton, 37 Green Road, Southsea, Hants. Tel: (0705) 811760.

SALE. HCCS Forth ROM plus manual, £20, also 'Spy' M/C monitor, £10. Willing to sell both for £28. Tel: T. Cain, Thanet (0843) 582852, after 6 pm.

WANTED: Atom technical manual, also software and hardware. Anything interesting considered. Tel: Sandy on Cardiff 619092, after 6 pm on weekdays.

BBC B Acorn DFS. 100k disc drive. Epson MX100 132 column printer. EPROM programmer and eraser. Wordwise. Discs, manuals, books and software. Worth £1,400+, sell £850 ono or split. Tel: Tyneside 284 3677, evenings.

DUAL disc drive for BBC, 40 track, hardly used, £270. Also Gemini Accounts package including Cash Book, Final Accounts, Mail List and Easiledger, £70. Tel: Pulborough (W Sussex) 2596.

WANTED. Any of these ROMs—View WP, Ultracalc, Printmaster, Watford DFS. Tel: 0254 47272.

BBC B Cumana 100k drive, BBC mono monitor, ROM board, lightpen, joysticks + various books + software. Offers over £850, will not split. Also Rega Planar 3 turntable, superb, with Goldring G920/GC cartridge. £150, no offers. Phone Mike, Liverpool 051-933 8387 after 5pm.

FOR SALE. P8271 disc controller chip and DFS ROM. Offers on Preston (Lancs) (0772) 323543.

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MEMO pad program. Includes diary, address book and telephone numbers. Save your own files with this. Works only on cassettes not discs—only £3.50. Write to A. Dence, 8 Beare Close, Hoe, Plymouth PL9 9RT.

EPROMS 27128/16k unused, only £15 each. S. N. Baker, 3 Smallwood Road, Baglan, Port Talbot, South Wales SA12 8AP.

BBC B 1.2OS plus disc interface, tape recorder, Teletext receiver, Prestel acoustic modem, software, leads, books, magazines: all for £550 ono. Tel: 0462-59335 (daytime 0462-51114), Hitchin, Herts.

Now, the BBC

The BBC Micro has now taken a giant step into the world of business computing.

With the addition of its new Z80 second processor, it is the first computer at anywhere near its price to become fully compatible with CP/M software.

As most business computer users can verify, CP/M is the most widely used form of software in business today.

For £299, you're well and truly in business.

At £299, the Z80 adds 64K of usable RAM to the BBC Micro. And it allows you to use the CP/M 2.2 computer operating system.

It's extremely fast.

And besides giving you access to a vast new area of software, it enables you to use GSX graphics-based programs, the perfect complement to the BBC Micro's own superb graphics.

Free software and languages.

The Z80 second processor comes complete with five CP/M business programs.

To handle your wordprocessing, there's MemoPlan. It's a program with some highly sophisticated features, such as a safeguard against data loss through power cuts and the ability to show two documents simultaneously on the screen.

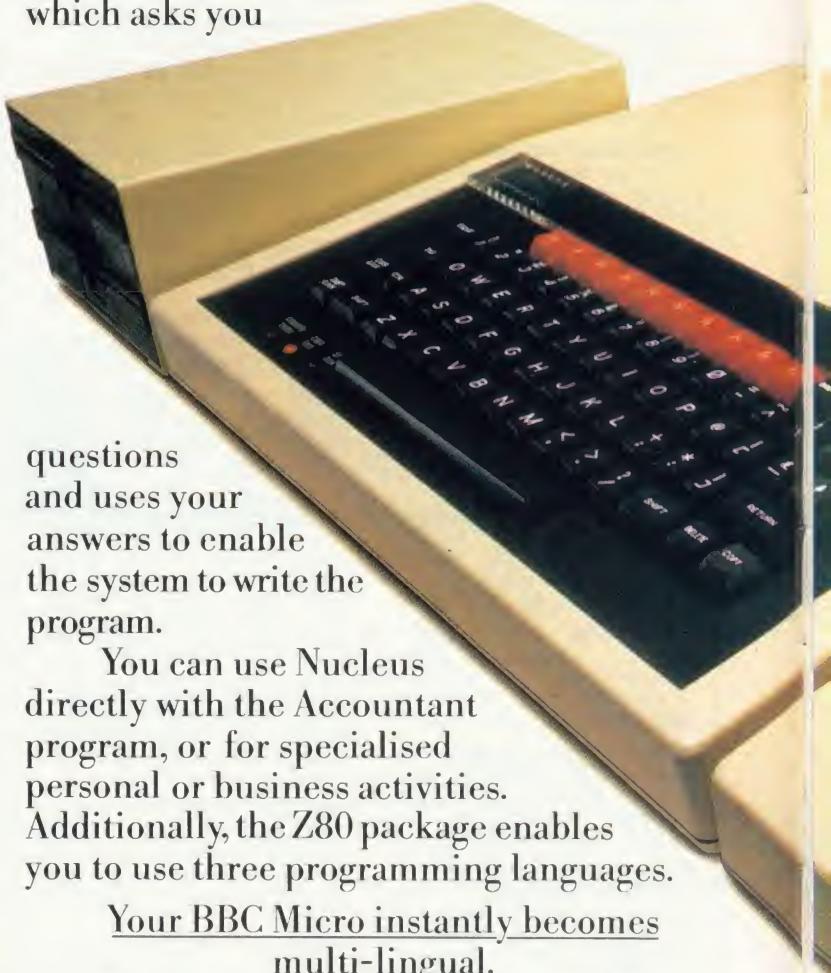
To form your CP/M personal database, there's FilePlan. It stores names, addresses, telephone numbers, stock listings and more. And if you use it with MemoPlan, you can generate personalised letters, labels and mail shots.

To produce forecasts and analyse groups of figures diagrammatically, simply use the GraphPlan program. This is incredibly helpful in working out vital business calculations, converting them into graphs and charts.

Meanwhile, in the book-keeping department, there's the Accountant program.

Use it to enter day-to-day transactions into the computer. Then, at any time, you can ask the computer to produce lists, summaries, reports, audit trails and trial balances. You can readily expand this package to a fully ledger based system, complete with payroll and more.

Finally, to help you to develop your own programs without having specialised experience, the Z80 comes with another software package called Nucleus. It's a system generator which asks you



questions
and uses your
answers to enable
the system to write the
program.

You can use Nucleus directly with the Accountant program, or for specialised personal or business activities. Additionally, the Z80 package enables you to use three programming languages.

Your BBC Micro instantly becomes multi-lingual.

To simplify writing your own software with the Z80, there's BBC BASIC.

For running professionally written business programs, there's Professional BASIC.

And then there's CIS COBOL, the leading microcomputer version of COBOL, the language used in mainframe computer applications throughout commerce and industry.

With CIS COBOL, the Z80 also gives you two sophisticated programming aids.

Macro.



One is Animator, an award winning debugging tool which enables you to identify programming errors quickly and easily.

The other is FORMS 2, which helps you to write your own interactive programs in COBOL.

With all these sophisticated features, the Z80 package is exceptional value for money. Indeed, bought separately the programs and languages could cost as much as £3,000.

See the Z80 at work.

The Z80 second processor is designed to be used with the BBC Micro Model B incorporating a Series 1.2 Machine Operating System and linked to a dual 80-track disc drive, a printer and monitor.

Ask your BBC Micro dealer to show you just how far it can go in the world of serious business computing.

For your nearest dealer, ring 01-200 0200.

Technical specification.

The Z80 has a 64K Random Access Memory, running CP/M 2.2 which provides approximately 55K bytes of RAM for user programs.

It operates at a clock rate of 6MHz.

Power supply is integral. Height, 70mm. Width, 210mm. Depth, 350mm.

The BBC Microcomputer System.

Designed, produced and distributed by Acorn Computers Limited.

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ANNOUNCEMENT

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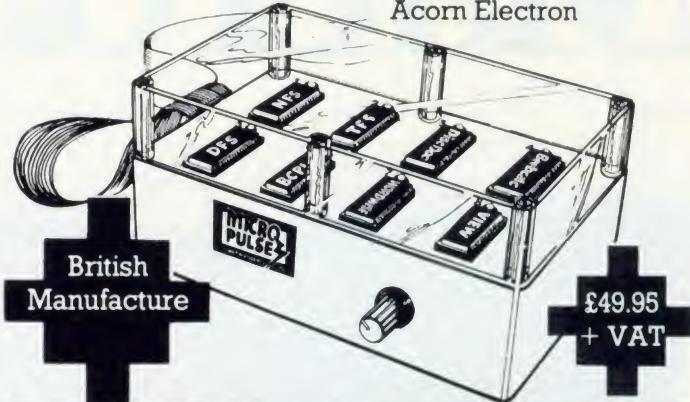
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please contact: Gareth Little, Mark Howard or Judith Allen at Micro Pulse Division



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Hermann Hosewheel talks to our man on the Cam Orson Fact

A LIFE IN THE DAY OF A HERMANN

176

“I awaken at 4.30 each morning and arise immediately. Before breakfast every day I take exercise, it prepares me for the day ahead. Some days I run only a half-marathon, but usually I run the full distance. I wave to Clive as I lap him at Grantchester.

I often fly to San Francisco for discussions at our research centre in Palo Alto. I buy California before returning for lunch with Chris.

We eat at Kings College where I did much of my research. I believe it is very important to keep up the old college ties, in fact we are thinking of buying Kings to house our growing R&D division.

Over lunch Chris and I discuss the next stage of the master plan. This is to asset-strip IBM. The two assets of value to us are their massive customer base and their worldwide chain of office blocks. We intend to strip out every installed IBM mainframe and replace it with a Beeb with Hyper-Tube interface to the Ultimate Machine (UM) that R&D are building.

■ THE MEP has drawn a blank with Sinclair in trying to draw up database guidelines.

Sinclair's boys are the only ones to express a wish *not* to participate, as virtue is apparently seen in incompatibility.

■ MARKETING man Tom Handbay has described reports of his replacement by a graduate as 'premature'. He claims that no-one in Cambridge has yet seen a working



Millionaire entrepreneur Hermann, 34, was born into the aristocratic Hosewheel family. Although the family motto is 'Ich bin nicht ein German' the Hosewheels originated in the Bavarian village of Beebonsberg before moving to Austria and wine-making. He followed a distinguished career in particle physics, discovering the atom, proton and electron. He is married to Pamela Rasp, the New Zealand bio-chemist. As yet they have no children but a very large Eonet at their home in Cambridge.

All the parasite terminals will be replaced with Acorn terminal emulators connected by our new Psychonet telepathic interface.

The IBM office blocks will give us the chance to diversify our operation into luxury hotels. By simply replacing the office furniture with bedroom furniture and the M in IBM with an acorn we will create in one operation the largest chain of hotels in the world. Hotel managers will come from the Product Services division.

After lunch I go to our R&D labs where I like to spend my afternoons solving the remaining problems on the AUT (Acorn Universal Tube). This is simply a high-frequency radio IO port which will interface with anything attached to a UTI (Universal Tube Interface). So on our future machines we supply just the AUT instead of the many interfaces of the BBC micro and to use, for example, a par-

allel printer only a Centronix UTI would be necessary.

After finishing the AUT we hold a board meeting and decide to buy some property in the City for a new London headquarters. Because we see further than the rest we agree to buy either the Post Office tower or the Natwest building.

In the evening, Pamela and I like to have a quiet night in, watching video repeats of Clive on *Spitting Images*. We are often invited to speak at official dinners, and I spoke recently on 'Acorns in an expanding universe' to the Ecological Astronomers Association. Being a bio-chemist Pamela is a wonderful cook and loves to make the traditional Austro-Maori dish Watanabe-schnitzel. Eddie the Android clears up and after playing with the Eonet we retire to bed to finish the day as it started.

Next week: Christopher W and

Graduate and that his recent plastic surgery in Silicon Valley worked wonders.

'I passed my ART (Android's Reliability and Training) examinations first time.'

■ THE Oric Muser has just announced a policy of not commenting on a new product until they know something about it. Trouble is, they need to fill their news pages.

■ ACE investigative reporter Orson Fact has compiled the latest 6502 second processor league table:

China	2
India	6
Wellingborough	17 *
Cherry Hinton	293
Soviet Union	1,347,513 **

* Still in parts awaiting shipment.

** Courtesy US Department of Defense.

ACORN ABUSER'S

Diary

OVERHEARD in a Cambridge tavern: 'I hear Acorn's dropped the 16032 second processor.'

'Really? What are they doing instead?'

'Something called the 32016. Apparently the same architecture as the 16032 but twice as late.'

■ A RECENT collaborative venture with Acorn has enabled Commodore to release the Plus 4 computer. It will work as a stand-alone machine but it was really designed as a second processor for the Electron.

We asked Acorn's Jean Vincent when we could expect Acorn to release the Plus 2 and Plus 3 to interface with the Plus 4: 'We are working very hard on them.'

'Currently, with all the add-on boxes, the machine is so deep it falls off the back of the desk.'

■ THIS month's Barry Woodentop Monumental Cockup award goes to Inferior Software for their Spectrum emulator on the Z80 2P.

MD Kai Gooney commented 'We're very excited to have won this award, proving our lead in the race to turn the Beeb into a really serious machine. Our ZX81 emulator is far advanced and after that we'll announce the Oric Atmost 4.8k.'

IN NEXT month's *Acorn User* we ask:

■ 'Does the Z80 second processor work with Disc Doctor in the IO processor?'

■ 'Is Chris Curry related to Gandhi?'

■ 'Is Hermann really a German?'

In the meantime see if you can guess the answers from the following anagram: ON

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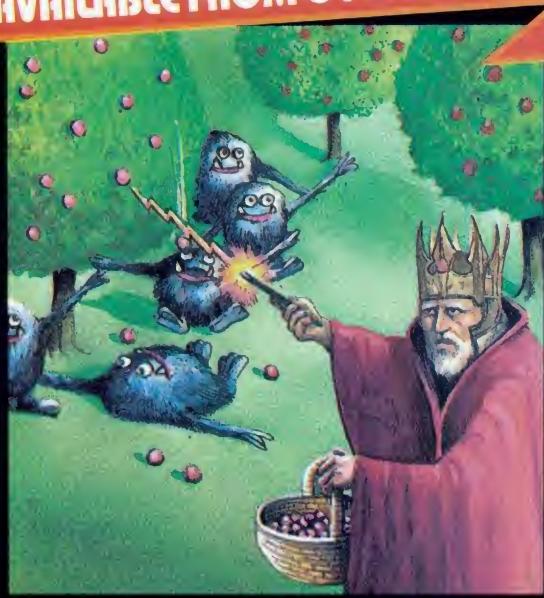
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